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ABSTRACT

Various individuals have expressed the opinion that South African school children are insufficiently trained in environmental education. This study is an attempt to assess the situation in secondary schools under the control of the Transvaal Education Department. Special attention is paid to the teaching of biology and geography as vehicles for environmental education. The assessment, made against the background of recent world developments in the theory and practice of environmental education, is based on a review of: (1) secondary school syllabi for biology and geography (aims, objectives, course content); (2) teacher training with special reference to pre-/in-service environmental education; (3) relevant resources (including fieldwork venues and teaching aids), both with regard to suitability and availability; and (4) contributions made by both governmental and non-governmental administrative, advisory, and supplementary organizations. The study concludes that, while the Transvaal Education Department is making a contribution toward the development of environmental education in its secondary schools, there are a number of areas in which improvements could be made. Recommendations are reported under the following headings: frames of reference, aims of school syllabi, content of school syllabi, pre-service teacher training, inservice-teacher training/facilities, resource materials, syllabus/subject committees, government auxiliary services/organizations, and role of non-governmental organizations. (JN)

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ENVIRONMENTAL EDUCATION IN TRANSVAAL SECONDARY SCHOOLS AND ITS RELATION TO THE TEACHING OF BIOLOGY AND GEOGRAPHY

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by

LYNN BOYD HURRY

submitted in accordance with the requirements for the degree of

MASTER OF EDUCATION

in the subject

DIDACTICS

at the

UNIVERSITY OF SOUTH AFRICA

SUPERVISOR : PROFESSOR R.M. YULE

DECEMBER 1980

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P R E F A C E

This study is the direct result of the interests and activities of the Wildlife Society of Southern Africa with regard to Environmental Education in Southern Africa.

The Wildlife Society, which has its headquarters in Johannesburg, is the largest organsiation of its kind in Southern Africa. It is deeply concerned with the conservation of the natural environment (which includes all forms of plants and animals together with their habitat) and with improving the quality of life of all the people of Southern Africa. It recognises the fact that Environmental Education is essential if there is to be an informed public that can make wise decisions regarding resource utilisation and the protection of wildlife and their habitats, whether these decisions be at a personal or at a collective level.

The Society has limited resources of personnel and finance and sees its role in Environmental Education as informative and supportive.

In its dealings with the public at large and with environmentalists generally, the Society has heard criticism of the position of Environmental Education in the South African school system. In an attempt to obtain a clearer picture of the situation the Society initiated a survey of all education departments, and in 1978 published a report on its findings. (Hurry, 1978 (a)). This study is complementary to the Wildlife Society report in that it examines in detail the contributions of a single education department to Environmental Education through the teaching of Biology and Geography.

The writer gratefully acknowledges the suggestions and critical appraisal of Prof. R.M. Yule who supervised this study, and the help of Mr. J.P. Degenaar of the Department of Didactics, University of South Africa, for his helpful comments. I must also express my gratitude to the librarians of the University of South Africa, particularly Mrs. A.M. Wilken and Miss M.S. le Roux who were of invaluable assistance with regard to source materials. I am grateful to Mrs. R. Ullyatt who edited the final draft, to Miss F. Eloff who drew the figures in this work and to Mrs. G.V. Gray who did an excellent job with the typing.

A final word of thanks must go to my family who were a constant source of encouragement.

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SUMMARY

Various people have expressed the opinion that South African school children are insufficiently trained in Environmental Education. This study is an attempt to assess the situation in secondary schools under the control of the Transvaal Education Department. Special attention is paid to the teaching of Biology and Geography as vehicles for Environmental Education.

The assessment is made against the background of recent world developments in the theory and practice of Environmental Education.

The assessment is based on a review of :

1. secondary school syllabuses for Biology and Geography. (Aims and objectives and content)
2. teacher training with special reference to Environmental Education, both at pre-service as well as at in-service levels
3. relevant resources (including fieldwork venues and teaching aids), both with regard to suitability and availability
4. the contributions made by administrative, advisory and supplementary organisations, both governmental and non-governmental

The study concludes that, while the Transvaal Education Department is making a contribution towards the development of Environmental Education in its secondary schools, there are a number of areas in which improvements could be made.

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CHAPTER ONE

INTRODUCTION

1.1 THE BASIC PROBLEM

People in different parts of the world are of the opinion that the attitudes and behaviour of many young people of today do not reveal a concern for the health of the environment in which they live. In countries where formal education plays an important part in the development of the individual, a certain amount of the blame for this situation is laid at the door of the various educational systems (e.g. Tinley 1974:4, Hopkins 1976:6, Stapp 1978:5).

1.1.1 Problems with regard to Environmental Education in South Africa

A number of writers have investigated the position of Environmental Education in South Africa (e.g. Nightingale 1977, Hurry 1978 (a), Clayton 1979, Millar 1980). Within the South African context the following six points seem to have attracted the most attention :

(i) There appears to be a lack of suitable, broad-based aims and objectives relating to Environmental Education (Nightingale 1977:14, Millar 1980:5-7).

(ii) Schools and other educational institutions appear to lack suitable facilities for conducting outdoor Environmental Education progammes (Nightingale 1977:14, Hurry 1978 (a) : 55).

(iii) There appears to be a lack of suitable resource materials for either teacher or pupil (Hurry 1978 (a):21).

(iv) Teacher training programmes do not equip teachers for meaningful Environmental Education (Nightingale 1977:37, Hurry 1978 (a):53).

(v) School subjects are not taught holistically. It is therefore difficult to understand and gain insight into environmental matters (Tinley 1974:5).

(vi) Teacher initiated Environmental Education programmes are not given sufficient support by the education departments (Clayton 1979:112, 114-115).

1.1.2 Are there problems with regard to Environmental Education in the Transvaal?

The criticisms of Nightingale (1974), Clayton (1979), Millar (1980) and others refer to the South African educational system as a whole. There appear to be no criticisms which are specifically related to the Transvaal Education Department.

One of the main tasks of this study is to examine Environmental Education in the Transvaal Education Department, to see whether the criticisms of the South African educational system, mentioned earlier (or other criticisms) are applicable to the Transvaal Education Department.

1.1.3 Positive aspects of Environmental Education in the Transvaal

Although a number of writers have criticised education departments for their apparent lack of concern regarding Environmental Education, there appear to be relatively few writers who have come out in their defence. Of these Henning (1979), Barnard (1980) and Pasques (1980) would

seem to have been the most active. Henning (1979:53-67) discusses the role of various school subjects in contributing to Environmental Education. He mentions specifically Environmental Studies in the Junior Primary phase and Geography and Biology in the Senior Secondary classes. He stresses the value of fieldwork in these subjects, and discusses the valuable contribution of the Schools' Journey Service in this respect. Henning (op. cit.) also mentions the contribution of the Veld Schools to Environmental Education. He admits however that " a great deal remains to be done" (in the field of Environmental Education), but maintains that "provision has been made for developing the concepts of Environmental Awareness, Environmental Perception and Environmental Conservation" (op.cit.:66).

Barnard (1980 : Pers.comm.) and Pasques (1980) discuss the role of the Veld Schools with regard to Environmental Education. They both maintain that these schools contribute significantly to Environmental Education. They claim that being "out and about with nature" has a positive effect on the individual's attitudes to the natural environment. (The contribution of the Veld School movement is discussed in detail in section 5.2.1.3.)

The fact that relatively few people have come out in direct support of the efforts being made by the various education departments in general (and of the Transvaal Education Department in particular) in the field of Environmental Education, has hampered attempts to obtain an objective view of the situation. In this study an attempt has been made to establish both the strengths and the weaknesses of the Transvaal Education Department in Environmental Education in order to arrive at an objective assessment.

1.1.4 An additional problem - that of terminology

A number of writers have pointed out that there are many different interpretations of the term "Environmental Education", especially amongst members of the different education departments (e.g. Nightingale 1977:5, Hurry 1978 (a):55, Clayton 1979:118). Since decisions relating to the aims and objectives of "Environmental Education" would depend on its definition, a lack of clarity in this connection has hampered objective assessments of the role of education departments with regard to Environmental Education.

An important aim of this study is to establish a clearly stated unambiguous definition of Environmental Education. At the same time the aims and objectives of Environmental Education are also clearly stated.

1.2 THE OBJECTIVES OF THE STUDY

1.2.1 The primary aim

The primary aim of this study is to assess the contributions made to the field of Environmental Education by the teaching of Biology and Geography in Transvaal Secondary schools.

1.2.2 The secondary objectives

There are five secondary objectives :

(i) to establish a clear definition of Environmental Education with special reference to its aims and objectives;

(ii) to identify strengths and weaknesses in school syllabuses for Biology and Geography, with special reference to their contribution to Environmental Education;

(iii) to identify strengths and weaknesses in the teaching of Biology and Geography with special reference to Environmental Education;

(iv) to assess the extent and value of assistance given to teachers of Biology and Geography with regard to Environmental Education by organisations of a governmental as well as a non-governmental nature;

(v) to make recommendations regarding school syllabuses for, and the teaching of, Biology and Geography, in so far as Environmental Education is concerned.

1.3 THE APPROACH

In order to achieve these objectives the following aspects will be considered :

1.3.1 In Chapter Two all terms used in the dissertation will be defined. Environmental Education, in particular will be defined with as little ambiguity as possible.

1.3.2 Chapter Two also contains discussion on the aims and objectives of Environmental Education.

1.3.3 In Chapter Three the contents of school syllabuses for

Biology and Geography in the secondary school phase will be assessed for their contribution to Environmental Education.

In this connection :

1.3.3.1 The aims and objectives of the Biology and Geography syllabuses will be compared with those for Environmental Education.

1.3.3.2 The contents of the syllabuses for Biology and Geography will be assessed in the light of the definition of Environmental Education.

An assessment of the school subjects (aims and objectives as well as contents) will be made. The main criterion for assessment will be the nature of Environmental Education (as defined) with particular reference to its aims and objectives.

1.3.4 In Chapter Four the didactics of effective Environmental Education are discussed. An assessment is made of the potential of teachers in Transvaal Secondary schools for effective Environmental Education.

The assessment is made in the light of the following:

1.3.4.1 the nature of teacher training, both in-training as well as in-service, with particular regard to holistic teaching and to training for fieldwork;

1.3.4.2 the availability and quality of resource materials which could be used for Environmental Education.

The assessment of teacher potential for effective Environmental Education was made using the following :

(i) A questionnaire, which was sent to each of the departments of Biology and Geography, at each of the teacher training institutions. (A copy of this letter appears in Appendix B.)

(ii) Personal interviews, or telephone conversations with educationists involved with teacher training, or with other authoritative individuals.

(iii) Personal experience of teacher training at the Johannesburg College of Education during 1978.

(iv) A review of the resources available to both teachers and pupils, which could be of value for Environmental Education. These resources include audio-visual aids and printed materials. They also include fieldwork sites where teachers may conveniently be able to conduct meaningful Environmental Education projects or programmes.

1.3.5 Chapter Five deals with the status of administrative, advisory and supplementary organisations, both governmental and non-governmental, with regard to support given to teachers in the field of Environmental Education. In the main the assessments were made as the result of personal interviews with authoritative representatives of the various organisations. The writer himself has had experience on the Geography syllabus committees of two education departments (the Department of Education and Training, and the Transvaal Education Department) and has been an external examiner in Geography at Standard 8, Matriculation, and Teacher Training levels. (He is currently examiner for the Joint Matriculation Board.) Information on the Wildlife Society is also based on personal experience, since the writer has been a member of its Environmental Education Committee since its inception (and was in fact

the first chairman of this committee).

1.3.6 The final chapter deals with the conclusions drawn from the study as well as recommendations which flow from it. These recommendations relate, in the main, to improvements in the syllabuses for Biology and Geography in Transvaal Secondary education (both aims and objectives and subject matter) and to the teaching of Environmental Education.

1.4 SOURCES OF INFORMATION

Environmental Education is in its infancy in Southern Africa and there are no books on this subject dealing specifically with this region. There are, however, several valuable dissertations on South African conditions (by South African writers) which have proved invaluable. The introductory sections are largely based on American or British literature, together with the South African material just mentioned.

In addition to complete works on Environmental Education, there is a large variety of environmentally orientated periodicals, some of which specialise in Environmental Education, and some of which carry articles on Environmental Education from time to time. Overseas examples include REED, the quarterly publication of the Council for Environmental Education at the University of Reading in England, CONNECT, the occasional publication of the Environmental Education wing of UNESCO, THE CLASSROOM GEOGRAPHER, published in Brighton, England; the AUSTRALIAN SCIENCE TEACHERS' JOURNAL, published in Sydney, Australia and SCIENCE AND CHILDREN, published in Washington, U.S.A. In South Africa journals such as the EDUCATION JOURNAL published by the Teachers'

League of South Africa in Cape Town, the SOUTH AFRICAN GEOGRAPHER, published by the Society for Geography at Stellenbosch, ENVIRONMENT RSA, the official organ of the Department of Environmental Planning and Energy, and the various teaching publications of the provincial education departments, carry articles on aspects of Environmental Education from time to time.

With regard to commercially available resource materials, brochures were obtained from various suppliers in Johannesburg and Pretoria.

1.5 CHAPTER SUMMARY

This chapter has identified the basic problems of Environmental Education, namely that :

(i) many people blame the various education departments for an apparent lack of environmental awareness amongst today's young people ;

(ii) a number of writers have identified problem areas with regard to Environmental Education in South African schools ;

(iii) there are few people who have come out in support of Environmental Education programmes or projects in Transvaal schools.

The chapter has stated the aims and objectives for the study. The primary aim is to assess the contributions made to the field of Environmental Education by the teaching of Biology and Geography in Transvaal Secondary schools. Secondary aims relate to the teaching of Environmental Education and Geography in Transvaal Secondary schools.

The final section of the chapter provides details of the approach to the study as well as the sources of information. Much of the study is based on an assessment of the syllabuses for Geography and Biology, as well as personal contact with educationists involved either with the teaching of Geography or Biology or with the training of Biology or Geography teachers. Written references include both overseas and local books and journals and various local dissertations.

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CHAPTER TWO

DISCUSSION OF TERMS

2.1 INTRODUCTION

The correct interpretation of the findings of this study rests on the correct interpretation of terms. For this reason this chapter deals in detail with definitions of the basic terms, and discusses the thinking behind the derivation of these definitions.

In this chapter the following terms are defined and discussed in detail :

(i) Environment

(ii) Education

(iii) Environmental Education

(iv) Conservation Education

(v) Holistic Environmental Education.

2.2 ENVIRONMENT

In this discussion a distinction is drawn between the "bio-physical environment" (also known as the biological environment) and the "human environment".

The bio-physical environment is discussed in connection with basic ecological principles. Man is seen as an integral part of the ecosystem dependent on it for his biological needs. At the same time he is a cultural being and so is also part of a cultural environment.

2.2.1 The bio-physical environment - The basic ecological principles

The bio-physical environment is the immediate surroundings of an organism. It is the "sum of all external conditions and influences affecting the life and development of the organism" (Lapedes, 1974:175). These external conditions and influences include abiotic elements such as air, water, soil and gravity, as well as biotic elements such as other organisms (plants and/or animals).

An essential feature of the bio-physical environment of any particular organism is that there is a complex, perpetual set of interactions between the organism and its environment, and between the various elements that make up its environment. These interactions are as much part of the organism's environment as the individual elements themselves.

The study of the inter-relationships of organisms with their total environment is known as ecology. The system in which the organism interacts with its environment is called the ecosystem. The size of any particular ecosystem is decided by the researcher. It will depend upon the organism being studied and the nature of its interactions with its environment. It may be as small as a pond or as large as the Amazon basin. The earth itself may be seen as a single ecosystem, although to study it as such would be almost impossible.

Since this study is concerned with Environmental Education, i.e. education relating to the human environment, it would be valuable to discuss briefly the essential characteristics of ecosystems and particularly those ecosystems where man is a dominant element. This can best be done with the aid of a diagram and in this connection Figure 1 refers.

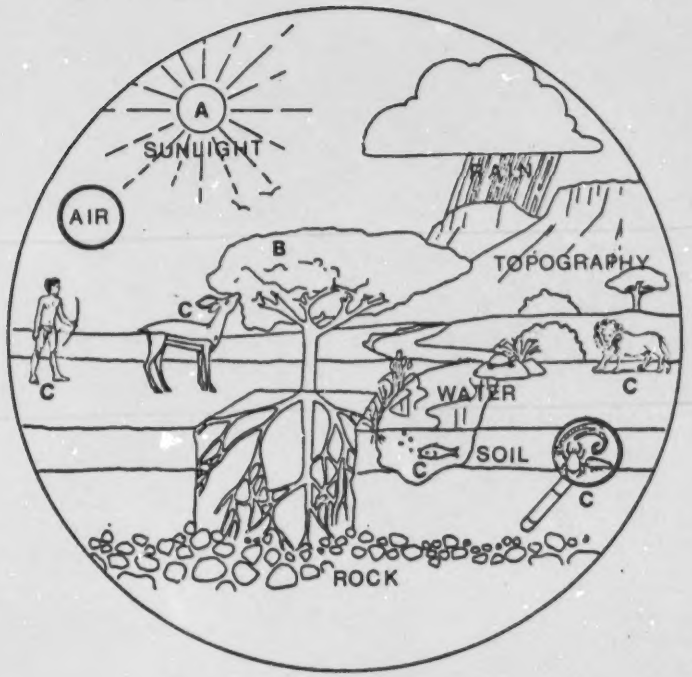


FIGURE 1 : THE ECOSYSTEM (THE BIO-PHYSICAL ENVIRONMENT)

From Figure 1 :

I. Energy in the ecosystem

A : Everything that works needs energy. The prime source of energy in the ecosystem is the sun.

B : Green plants are able to use the sun's energy to manufacture food for themselves.

C : Animals get the energy they need by eating plants or by eating other animals that have eaten plants.

II. Key elements in the ecosystem

The elements in the ecosystem may be divided into two general categories, namely abiotic elements and biotic elements.

Abiotic elements include sunlight, air, water, soil, rocks and other non-living elements.

Biotic elements include all living organisms, plant and animal and, most important, man himself.

III. Interactions in the ecosystem

An ecosystem is a functional system consisting of biotic and abiotic elements in which there is a constant and complex set of interactions between the elements. These interactions occur at many levels - among the biotic elements themselves, among the abiotic elements themselves, and between the biotic and abiotic elements. These interactions are as much part of the ecosystem as the biotic and abiotic elements.

it would be impossible to illustrate all the interactions in an ecosystem since there are too many to enumerate. Figure 2 shows a selected number of interactions and gives an indication of the complexity of the total system of interactions.

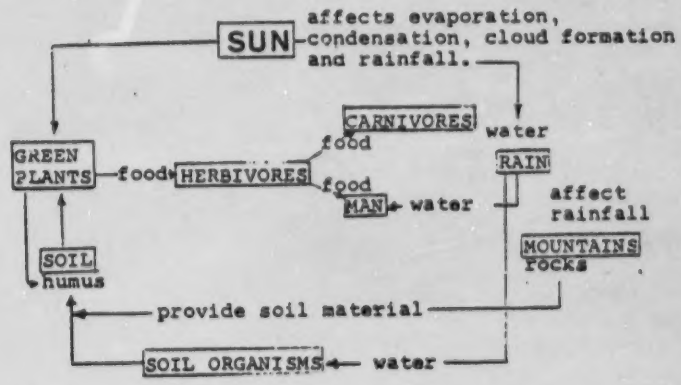


FIGURE 2

SELECTED INTERACTIONS IN AN ECOSYSTEM

An essential feature of an ecosystem is that the interactions within it seek to maintain a state of homeostatic equilibrium. Whenever there is an imbalance within the system, interactions will occur which will tend to re-establish the balance. This is true for both biotic as well as abiotic elements. Examples of homeostatic equilibrium at

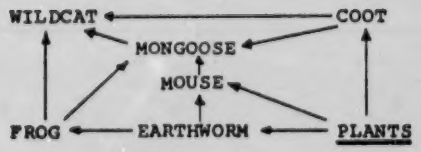
work include the movement of air as a result of energy differentials (the basis of the world's climatic patterns) and the dying off of animals in large numbers following a population explosion. (The lemmings of Asia and North America provide the most classic example of this.)

IV. Food chains and food webs

When an animal eats a plant and is then eaten by another animal, the sequence of events is called a food chain. When food chains inter-connect they form food webs.

GRASS ⟶ FIELDMOUSE ⟶ HAWK ⟶ WILDCAT

A SIMPLE FOOD CHAIN



A SIMPLE FOOD WEB

FIGURE 3 : FOOD CHAINS & FOOD WEBS

V. Trophic levels

The word "trophic" is derived from the Greek word "trepho" which means to nourish. Trophic levels indicate the links in the food chain. Each link consists of organisms which have obtained their food in the same number of steps in the food chain. Thus the first trophic level consists of green plants. They have all obtained their food through photosynthesis. The second trophic level is the herbivores. They all eat green plants. The third trophic level consists of the carnivores since they all obtain their food by eating the herbivores. Animals which obtain their food by eating other carnivores (for example, snakes which eat other snakes) occupy trophic level four. There are other animals which occupy more than one trophic level, for example the detritivores (detritus eaters) which feed on dead plant and animal material. Omnivorous man also occupies more than one trophic level.

VI. Food pyramids

As energy is passed along a food chain or through a food web, a large proportion is lost during metabolic processes at each trophic level. The significance of this is that a relatively large biomass of either plant or animal material is required at low trophic levels to support a lower biomass of animals at higher trophic levels. When this phenomenon is represented graphically it results in a pyramid shape. This has led to the use of the term "food pyramid" when trophic levels are discussed. Animals at high trophic levels are near the apex of the pyramid (i.e. low in numbers)

while animals at low trophic levels are near the base (.i.e. high in numbers). A large biomass of plant material forms the base of most, if not all food pyramids.

A corollory to this is that if an animal at a high trophic level (e.g. man) increases in numbers for any reason, then increased demands are placed on organisms (such as plants and plant eating animals) at lower trophic levels.

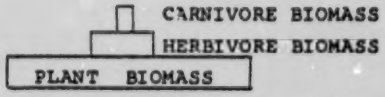
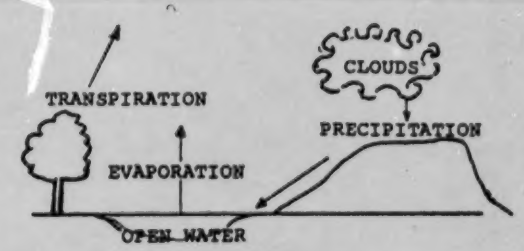


FIGURE 4 : THE FOOD PYRAMID

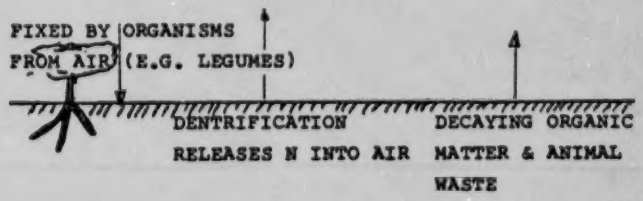
Cycles in the ecosystem

The ecosystem is characterised by the constant recycling of a number of key elements. Water, carbon, nitrogen and phosphorus are some of these, although there are a number of others. Figure 5 illustrates two of these cycles, namely the hydrological cycle (water cycle) and the nitrogen cycle.

In an ecosystem which has been relatively undisturbed by man, the rate of cycling for each element remains relatively constant. Changes that may occur usually take place over a long period of time. (Climatic changes for example may take thousands of years.)



THE HYDROLOGICAL CYCLE



THE NITROGEN CYCLE

FIGURE 5 : CYCLES WITHIN THE ECOSYSTEM

VIII. "Take-outs" and "in-puts"

Organisms within an ecosystem " live off" the ecosystem. This occurs at two levels. On the one hand they take out of the system what they require for respiration and nutrition and on the other the ecosystem provides them with a habitat in which to live safely and reproduce.

Organisms also make "in-puts" into the system at two levels. On the one hand they put in waste products of respiration and nutrition and eventually will die and return to the system through decomposition, while on the other they may change the system through their activities, for example termites building huge mounds or birds making nests.

Whatever the "in-puts" and "take-outs" the nett result is to contribute to an overall state of homeostatic equilibrium in the ecosystem.

IX. The interconnectedness of systems

A fundamental concept of natural systems is that they are all interconnected. As we have seen, the world may be viewed as a single ecosystem. Ecosystems within it, selected and demarcated purely as a matter of convenience by the researcher, are all part of the one major system. Whatever happens within each smaller unit will affect the whole, and whatever happens within the whole will affect each small unit. As we shall see later, man and his culture make up a cultural environment which is an integral part of his total environment.

Changes within the cultural environment will affect the bio-physical environment in the same way as changes in the bio-physical world will affect man and his culture.

X. The concept of habitats

We have seen that an ecosystem is a "life-support" system for a variety of organisms and that an essential characteristic of the ecosystem is the complex set of interactions which take place within it.

Every organism occupies a particular place in the ecosystem. This is the place in which it can obtain its nutrition, defend itself (or be protected) from potential harm, and where it can reproduce. This place is known as the habitat. It may vary in size from a few square centimetres under a stone, in the case of a patch of moss, to a mountain valley of a few square kilometres in the case of a bird of prey. The health and well-being of the organism (both at the individual as well as the species level) depend upon the health and well being of the habitat.

XI. Man in the ecosystem

In the biological sense of the word man is an organism within the ecosystem. He requires energy for his metabolic processes, he makes "in-puts" into his environment and takes out from it. He still relies on the ecosystem to some extent to supply him with a habitat. As with the other animals he is directly and indirectly dependent on the physical as

well as the biological components of the ecosystem (see Figure 1).

Many centuries ago, when man was essentially a hunter-gatherer, he lived in harmony with his environment. His activities and actions did little to upset the homeostatic equilibrium of the ecosystem. His "take-outs" were few and his "in-puts" did not affect the balance of the system.

As man developed from a hunter-gatherer into an agriculturalist he began to make greater and greater impact on the environment. By growing crops in the same soil year after year, and frequently practising monoculture, he depleted the soil. Since he had broken the natural cycle of soil replenishment, he had to find ways and means of restoring its goodness. He learnt in time either to move on to new areas allowing the old areas to recover naturally (the so-called slash and burn agricultural system which is still found in parts of Africa today), or to add something to the soil to keep it fertile. In some parts of the world, for example along the Nile and the Ganges, annual floodings by large rivers brought fresh fertile silt to the lands.

As his numbers grew man improved his agricultural skills. He found constantly better ways of ensuring soil fertility and began producing more from the same areas of land. This led to the establishment of larger and larger settlements, and with the growth of settlements came a rapid

growth in technology, especially in industrial development. As this development accelerated man began to take more and more out of his environment : wood, water, minerals, oxygen (during combustion large quantities of oxygen are consumed) and, to feed the increasing populations, more and more from the soil. He also cleared more and more of the natural vegetation for his fields or for his settlements, thus not only removing the vegetation, but permanently removing a prime source of oxygen from his environment. At the same time he started putting more into the environment, particularly substances which hitherto had only appeared in small quantities - smoke, noxious gases, liquid effluents, sewage and industrial waste.

Technological man has also been " medical man". He has learnt to overcome diseases which used to kill off thousands of people. The result has been an increase in world population, starting gradually as medical knowledge developed and accelerating to frightening proportions in recent years. Table 1 below illustrates this :

TABLE 1 : ESTIMATED TIMING OF EACH BILLION OF WORLD POPULATION (Department of Education and Culture : 1979.)

	Time taken to reach	Year attained
First Billion	2 - 5 million years	1800 AD
Second Billion	130 years	1930
Third Billion	30 years	1960
Fourth Billion	15 years	1975
Projections		
Fifth Billion	12 years	1987
Sixth Billion	11 years	1998

Increasing population results in more "in-puts" and "take-outs" from the ecosystem. Whereas many of these do not adversely affect the equilibrium of the system, there are many that do. Examples of "take-outs" that have ill effects for the ecosystem are legion. In addition to the depletion of non-renewable resources such as minerals, there is also interference in the ecosystem through the depletion of soil fertility, the increasing use of water and the reduction of oxygen levels. There are other, less obvious, problems caused by excessive "take-outs" from the ecosystem. By killing off (i.e. taking out) birds of prey, farmers interfere with a natural process for controlling rodents. They interfere with a natural homeostatic process and need to find alternative means of replacing it. The alternative means are often as damaging to the ecosystem as they are helpful (for example the use of poisons to control the rodents), and so further imbalances are often introduced.

The "in-puts" into the ecosystem may also be damaging to its health. The most obvious of these are air and water pollutants which affect the ecology of vast areas. Less obvious detrimental "in-puts" are the introduction of "foreign" organisms (i.e. organisms from other areas) into ecosystems. These include plants as well as animals. Of the plant "in-puts", Nasella grass, which originates in South America, is at present threatening vast areas of grazing land in the Cape. The grass pushes out other species and is most unpalatable for stock. It also has a very low nutritional value. There are other examples of detrimental plant "in-puts". These include the Hakea shrub which is threatening to take over mountain areas in the Knysna area and the poisonous Lantana shrub which has spread over most of Southern Africa. South Africa is fortunate in not having had

many foreign animal "in-puts". Australia suffers millions of rands' worth of damage annually as a result of damage done to grazing areas by rabbits introduced from Europe.

The inter-connectedness of ecosystems has already been noted. It is most important to note that any "in-puts" or "take-outs" from any one ecosystem will have an effect on others. The effect may be confined to a relatively small area, or may include the whole earth. A good example of this is the proposed clearing of large tracts of forest in Brazil to prepare the land for cultivation. Experts predict that this will seriously reduce the amount of oxygen produced by plants, and could also affect the earth's climate because of a loss of transpiration from the trees. Another good example are the smoke discharges from British factories. These are carried high into the air and are transported eastwards by the prevailing westerlies. The smoke contains sulphur dioxide which combines with rainwater to form a weak acid. This acid, in falling to earth with rain or snow, has an adverse effect on tree plantations in countries such as Norway and Sweden.

We have noted that ecosystems tend to seek homeostasis once an imbalance is introduced into them. Man is having a direct effect on this homeostasis. On the one hand he is blocking natural processes (such as population control) while on the other he has not yet proved capable of replacing them with his own. At the same time he is constantly introducing imbalances into the ecosystem which could result in detrimental changes to it.

We have also noted that the health of the individual

organism depends upon the health of the ecosystem in which it lives. Aldo Leopold has described the "health of the land" as its "capacity for self-renewal" (Leopold, 1966:16). In this case the inference is that the land should be "renewed" first and foremost to support man. We have also noted that the health of the ecosystem is related to a complex system of elements and interactions and the inference of this is that man needs to understand these better if he is to assist in their maintenance. Modern man needs not to turn back the clock to re-establish the status quo, when as a simple agriculturalist he lived in harmony with his ecosystem, but he does need to use his intellectual powers to establish a new, improved working relationship with the ecosystem of which he is part.

2.2.2 The human environment

We have seen that the bio-physical environment in which man lives consists of a complex system of elements and interactions. We have also seen that man, in the biological sense, is an organism within that system, and as such is dependent upon it. At the same time man affects the system either positively or negatively through his "in-puts" into it or his "take-outs" from it.

In addition to his biological characteristics man also has a spirit and an intellect. These characteristics set him apart from the other (biological) animals, and create a new dimension to his environment, so that an additional term, the "human environment" is necessary to describe the complete environment in which human beings live.

Social anthropologist David Davies (1972:77) describes the human environment as "the surroundings, both physical and spiritual, in which the individual grows, and which affects the growth and development of that individual". Another anthropological view of the human environment is that it is "the totality of the external conditions and influences that affect man" (Winick, 1956:144). Sociologists seem to have a similar view, Theodorson (1967:132) describes the human environment as "everything that stimulates and influences the behaviour of the individual or the group". He talks of conditions and events which make up the environment, describing them as "physical social or cultural" (op. cit.). For the psychologist the human environment is the "sum total of external conditions including social and physical factors which have the potential to influence the individual".

Finally Farrant (1964:266) supplies an educationist's viewpoint by describing the environment as "everything in the child's immediate vicinity which can influence its development". Farrant stresses the fact that learning from the environment can be conscious or unconscious, co-ordinated or unco-ordinated, and emphasises that the learning environment should be manipulated to provide the best conditions possible.

It is apparent from the foregoing that cultural activities and their products are an integral part of the human environment, and for this reason further discussion on the nature of "culture" would be of value. Culture has been described as "all that is non-biological and socially transmitted in a society, including artistic, social, ideological and religious patterns of behaviour". (Winick, 1956:144). For

convenience it may be considered as having two components. The first consists of the patterns of behaviour involving individuals or groups within the culture, and the second consists of the artifacts and products of that culture. (These may range in size and complexity from small tools to large structures, roads and other features.)

Since the artifacts and products of a culture impinge directly on the bio-physical environment (they are, in fact part of the "in-puts" into the ecosystem that were discussed in section 2.2.1), they may be described, for the purposes of this study, as merging with it to form a third "environment" namely the culturo-bio-physical environment (see Figures 6 and 7). Together with the bio-physical environment, this environment provides the focus of attention for Environmental Education.

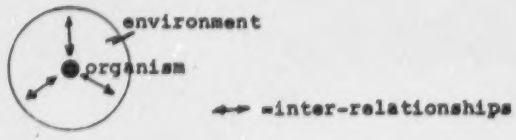
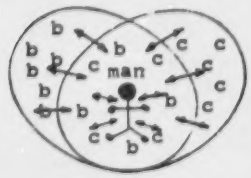


FIGURE 6

THE BIO-PHYSICAL ENVIRONMENT



Environments

b= bio-physical

c= cultural

bc= culturo-bio-physical

↔ = inter-relationships

FIGURE 7

THE CULTURO-BIO-PHYSICAL ENVIRONMENT

(HUMAN ENVIRONMENT)

2.2.3 The totality of the human environment

The definitions of the human environment all refer to the "totality" of phenomena within it. Words such as "totality", "everything" and "sum total" are used. There is no limit to the catalogue of elements, either cultural or bio-physical, which may be identified in the environment of a single human being. The "growth and development" of the individual is in response to this total environment, and not just to a limited number of elements within it.

A number of writers have pointed out the "total" relationship that the child has with his environment. Viljoen and Pienaar (1971 : 188) describe the world of the child as a "totality of situations, events and cultural values ..... in which his behaviour, thoughts and feelings are involved...." Good (1973 :204) describes the total environment of the child as "all the objects, forces and conditions that affect the individual through such stimuli as he is able to receive" and goes on to say the child may respond "consciously or unconsciously" to these stimuli.

2.2.4 Interactions within the total human environment

An important point which emerges from the definitions of the human environment is that there is constant interation between the individual and his environment. This interaction may range from a purely physical response to the bio-physical components (such as breathing, being warmed by the sun, eating and so on) to complex social interactions with other individuals or groups. These interactions are as much part of the human environment as the human or bio-physical elements themselves.

It is significant to note that both the anthropologist and the psychologist have recognised the reciprocal relationship that an individual has with his environment, and have "borrowed" the term "ecology" to describe it. Just as ecology is the study of organisms interacting with their environment (Lapedes, 1974 : 148), so "cultural ecology" deals with the relationship between social organisations and the environment (Hunter, 1976:98) and "behavioural ecology" concerns the relationship between patterns of human behaviour and the environment in which they take place (Dushkin Publishing Group, 1973 : 28). A similar concept, that of "learning ecology", could as easily be used to describe the relationship which a child has with its environment. This concept would provide a useful frame of reference for studying the relationships within the child's environment that affect its learning processes.

The relationship which an individual has with his environment, particularly with his bio-physical environment, is of particular significance for this study.

2.2.5 Summing up of the environment

(i) The environment of an organism, whether human or non-human, consists of all those factors that affect its growth and development.

(ii) The word "environment" is used synonomously with the term "ecosystem". An ecosystem is a system consisting of bio-physical elements constantly interacting with one another.

(iii) The organism is influenced by the "total" ecosystem and not just by single elements within it.

(iv) Man is an integral part of the ecosystem and is dependent upon it. At the same time he is capable of changing the ecosystem through his activities.

(v) In addition to being in a bio-physical environment, man is also part of a cultural environment. This cultural environment combines with the bio-physical environment to add a new dimension to the factors affecting man's growth and development.

2.3 EDUCATION

2.3.1 The general aim of education

Having discussed the term "environment", what of "education"? A search through the literature soon reveals that there are as many opinions on the subject as there are writers. Let us consider some of these :

(i) Gutek (1974:4) writes : "Education refers, very broadly to the total social processes that bring a person into life in a culture."

(ii) Schofield (1972:39-40) says simply : "Education is a process of initiation" (where "initiation" refers to "exposure" and "commitment to situations" in the environment).

(iii) The Dictionary of Education defines education as "the aggregate of all processes by means of which a person develops abilities, attitudes and other forms of behaviour of positive value in the society in which he lives". (Good, 1973:202.)

(iv) Yule (1978:7) states that it is the purpose

of education to lead the child to responsible adulthood, or cultural maturity, which implies that the child becomes part of the structure of the society and as an adult takes his place in society.

(v) Van Rensburg (1979:251) defines education as "the conscious purposive intervention by an adult in the life of a non-adult to bring him to intellectual independence." He goes on to say that education is "a purposive act, designed to guide the child's humanisation on a determined course". (Where humanisation is to become a "moral, civilised and cultured being".)

(vi) Oberholzer (1954:49) discusses education at some length : "Opvoeding is die geheel van (sic.) met voorbedagte rade tewerkgaande, dit is bewuste, doelbewuste, opsetlike, gesistematiseerde and verantwoordbare, gewilde gedragswyses wat van sedelike selfstandiges, bekend as opvoeders - onder-gesag uitgaan, met die doel om 'n verandering of veranderinge waaraan waarde geheg word by ander persone, bekend as sedelike onselfstandiges to veroorsaak en op die duur te bestendig sodat hierdie opvoedelinge as sedelike selfstandig-wordendes die voorgestelde veranderinge as eie gedragsnormerende doelstellinge innerlik as behoorlik sal aanvoel en aanvaar, en deur eie wilsbeslissinge aanhoudend sal probeer verwesenlik."

(vii) Viljoen (1971:15-18) also discusses education in some depth. He describes education as the "leading forth of a person from the sphere of childhood towards that of an adult." He mentions the roles of both educand and

educator, and emphasises the fact that the latter is guided by social norms in deciding on the nature of the education for the educand. He agrees with van Rensburg and others in saying that education has a definite object in view, and that education must be carefully planned.

From these seven statements three important may be extracted : the first is that education involves a number of complex on-going processes; the second is that these processes are not random processes, but have been purposively thought out; and the third is that education leads to behaviour which is acceptable within a particular culture. It is this last point which holds most significance for Environmental Education, since in a number of cases conservation practices are not, as yet, part of the culture,(for example, amongst some peasant farmers in rural South Africa). It is for this reason that the cultural element in education needs to be discussed further.

Culture may be defined as "the total pattern of human behaviour and its products, embodied in thought, speech and action, and artifacts, and dependent upon man's capacity for learning and transmitting knowledge to succeeding generations." (Websters International Dictionary, 1968: 552). Karlin (1967:114) points out that cultures emerge as a result of the operation of "geographical, biological, psychological and historical forces " and it is the variability of these forces that results in diverse cultures.

Karlin and other writers (e.g. Hoebel, 1958: 593-608; Turner-High, 1968: 142-147) have also pointed out that cultures are never static and that changes within them are continuous. Turner-High lists cultural diffusion, imperfect imitation of one generation by

the succeeding generation and changes in the bio-physical environment as three of the more important factors affecting cultural change. Hoebel elaborates on the last point when he discusses change in cultural "systems" as a result of their position within the "vast natural system". He points out that whereas every single system tends to "perfect its own symmetry" within itself, the fact that it is connected to other systems, and in particular to "nature" with its finite asymmetry, instability and disturbance", means that it it constantly changing in reaction to changes from without.

Karlin (1967: 114) points out that if cultures were not adaptive then they would not endure. At the same time he also points out that cultures must be structured and protected by customs, mores, norms, and laws and that changes, if they are to be permanent, must be acceptable to society.

The seven statements on education (given above) do not include the element of change in the cultural milieu, and a more comprehensive definition is needed to cater for this. In this respect assistance may be sought from Kneller (1978: 14) who, while agreeing that the first task of education is "to perpetuate the achievements of culture", stresses the fact that "(education) paves the way for cultural change". Kneller sees this being done by preparing the young to anticipate "happenings" and goes on to pose the question "Can it (education) train the coming generation not merely to adapt to, but also to initiate specific changes in the culture?" Weinberg's (1971: 77) comments in this regard are also of interest. He recognises reciprocity between education and culture. He sees education as a functional part of a total society, and that "reciprocal change relationships will always exist between the several parts." Kazamias

(1971:636) discusses reciprocity between education and politics. He quotes the example of Tanzania where radical changes were introduced by the central government in response to a "call by the people" for educational goals in accordance with "the new national identity and aspirations".

Yule's (1980)+ definition of education caters for both the aculturation of the individual as well as for the changing nature of his culture. Education according to Yule "is the conservation, transmission and renewal of culture (my underlining). The definition states nicely the dual role of education. On the one hand it prepares a young person for "life in a culture" (see Gutek's statement on education), while on the other it is the mechanism whereby succeeding generations (consciously or unconsciously) implement change. Yule's definition is particularly appropriate to this study where, it will be argued, cultural changes relating to environmental attitudes are necessary to improve Environmental Education.

In the above discussion emphasis has been more on a "general" education which includes both school and home education processes. It would be useful to discuss briefly the nature of "school" education as a separate entity. Van der Stoep and van der Stoep (1973:9) maintain that school education has the responsibility of presenting "the cultural heritage" of the child in such a way that it is "adequately assimilated". This is a specific aspect of the child's development towards adulthood for which the school is responsible. Gutek (1974:4) defines school education as a "specialised social agency established to cultivate preferred skills, knowledge and value in a learner". Both definitions agree with the broader definitions discussed above in stressing the role of the school as an agent of aculturation (preferred

+ Yule (1980): Pers. Comm.

skills, knowledge and values being part of the culture in which the schooling takes place). Neither of them, however, allows for the element of "renewal" or change and it would be useful, at least for the purposes of this study, to add the following to the definitions : "(where the culture may change in response to changing environmental circumstances.)" Kneller (1978:80) lists three ways in which culture (and therefore education) may change. The first is through origination, which is the discovery or invention of new elements, the second is diffusion, which refers to the borrowing of new elements from other cultures, and the third is reinterpretation, which is the modification of an existing element to meet fresh circumstances. He also mentions the problem of cultural lag which signifies the tendency of some areas of culture (education, for example) to change more slowly than others in response to the aggregate of environmental changes. The three processes of change, and the problem of cultural lag are significant when the response of educational authorities to environmental changes (e.g. changes in technology, changes in values, changes in environmental quality) is considered in the light of Environmental Education.

2.3.2 The didactic principle of totality

A number of writers have discussed the didactic principle of totality (e.g. Yule, 1979:24-25; Duminy, 1980: 22-23). This principle emphasises the fact that the educand (i.e. the person being educated) is a total human being with many different facets to be developed. In addition to the more usually considered facets of intellectual and physical development, there are other aspects such as emotional and spiritual development to consider.

In the didactic situation, although intellectual development may receive most emphasis, the educator must constantly be aware of the educand's other developmental needs. This implies that, although teachers may be concerned with the teaching of particular school subjects (particularly in the secondary school situation) these subjects should always be taught against the background of the developmental needs of the "total" child. As we have seen, the development of the child takes place within a particular cultural context, and the implication of this is that the contents of school subjects (and their aims and objectives) must be acceptable to the culture as a whole.

2.3.3 Subject orientated objectives - the example for Geography

The discussion thus far has highlighted two important aspects. The first is that education is a form of acculturation (and hence takes place within a particular cultural context) and the second is that education is generally child centred.

In the school situation the child is usually taught various school subjects as part of its general education. Each of these subjects has its own aims and objectives which have been compiled to give the child knowledge and insight into that subject. At the same time the aims and objectives need to be orientated towards the development of the "total" child within his or her culture.

It would be useful to examine a set of subject objectives which cater for both the requirements of a subject as well as the needs of a child. In this connection the

work done by Marsden with regard to Geography as a school subject is of interest (Marsden, 1976:29-30).

Marsden bases his objectives for the subject on the work done by Bloom and his associates in the field of educational objectives (Bloom, 1956:201-207; Kratwohl and Bloom, 1964:174-185). He takes two domains of objectives, namely the cognitive and affective domains, and applies the sub-categories of each to the teaching of school Geography. In doing so he creates an incisive picture of what good subject teaching should be, taking both the requirements of the subject and the needs of the individual into account.

The following is a summary of Marsden's discussion on these objectives.

(i) The cognitive domain of educational objectives

1. Knowledge

Knowledge refers largely to the recall of information or the recognition of information on maps or photographs. An example of knowledge is the ability to recall information about the Trasvaal Highveld or to recognise specific features of the Highveld on photographs.

2. Comprehension

Comprehension involves the ability to translate one form of information to another form, for example to draw a relief profile from a contour map.

Comprehension also involves interpretation

of facts, for example the explanation of the impact of the physical, economic and social factors on activities such as farming or tourism. It also involves the ability to elucidate relationships that exist between phenomena.

Finally, comprehension involves the ability to extrapolate from an acquired set of data to a future situation. An example of this is weather forecasting based on a recent synoptic map.

3. Application

Application implies the ability to use abstractions in particular or concrete situations, for example to apply the concepts derived from a study of the Transvaal Bushveld to the Bushveld of Natal.

4. Analysis

This is the ability to break down a set of information into its constituent elements, and in so doing to recognise its key elements.

5. Synthesis

Synthesis involves the ability of putting together elements gained through research or study to form a whole.

6. Evaluation

Evaluation involves the ability to make judgements about the value of something in

qualitative or quantitive terms, for example to appraise the visual elements of the Drankensberg landscape which are said by some to be particularly attractive.

(ii) The affective domain

Marsden goes on to discuss the affective domain of educational objectives as proposed by Bloom and his associates. He sees the importance of the affective domain despite the fact that values, attitudes and beliefs are difficult to decide on in the first place, and difficult to measure in the second.

1. Receiving

Receiving involves the awareness of Geography as a discipline. It involves a willingness to accept Geography as a subject of importance, and finally it involves a sensitivity to information about Geography.

2. Responding

In responding the student is willing to read assigned literature on Geography. He voluntarily acquaints himself with the current Geographical literature. The student also enjoys a discussion or argument on current issues in Geography.

3. Valuing

Valuing involves an identification on the part of the learner with Geography. The student assumes an active role in the subject.

At the same time the student displays a loyalty to Geography in that he supports meetings and other activities which could make a contribution to Geography.

4. Organisation

Through conceptualisation the student develops a rationale about the role of Geography in the world at large. The student forms judgements which reflect the belief that Geography provides a system of enquiry that helps to understand and solve world problems.

5. Characterisation by a value or a value complex

The student learns to view problems primarily from a Geographical point of view. For example, air pollution is seen from a Geographical, rather than an aesthetic, political or economic point of view.

Characterisation also involves the development of philosophy of life consistent with Geographic theory or practice. Such a philosophy of life would reflect concern for the full range of Geographic fields from town planning to resource management.

2.3.4 Subject orientated objectives - the transfer to other subjects

In section 2.3.3 an analysis of specific objectives for Geography as a school subject was made. The formulation of these objectives was aimed at giving the teacher definite guide-lines for the teaching (and learning) of

Geography. It is apparent from the analysis that the objectives are not just concerned with the acquisition of factual knowledge, but are also concerned with the development of insight into the subject in the broadest sense of the word. At the same time it is apparent that the objectives are not entirely subject orientated. There is ample scope for the development of the "total" child and that the intellectual and emotional development of the child is also catered for. It is in this area that the example has perhaps the most significance.

The set of cognitive and affective objectives that was arrived at for Geography, could just as easily have been developed for other environmental subjects such as Biology. The essential feature to consider when developing such objectives is that they be broadly based and cover both the requirements of the subject as well as the need of the individual within his culture.

2.3.5 The development of personal autonomy

As we have seen from the previous discussions the aims of education may either be viewed in broad perspective, or they may be focussed on individual school subjects. Although the perspective for each differs, each is complementary to the other, since, in the final analysis, the central focus of attention is the child being educated.

Arthur Harris, an English educationist, has suggested a single over-arching aim for education that includes both the broad view of education as well as the more specific view with regard to individual subjects. Harris's ideas are included here since they are relevant to most (if not all) cultures and may be applied to most school subjects (Harris, 1972:119-148).

Harris's single over-arching aim is simply the achievement of "personal autonomy", where personal autonomy involves the following four, overlapping, points :

1. Autonomy implies the acquisition of knowledge, where knowledge is far more than just an accumulation of facts. Knowledge implies the acquisition of skills such as those related to research and experimentation, and the ability to apply information to new situations. (This point is of significance when teaching programmes for Biology or Geography are considered, especially in the light of Environmental Education.)

2. Autonomy also implies that an individual is in a position to pursue individual interests or valued activities without hindrance. (Implicit in this is the fact that either the school or the local community should supply the opportunities or the amenities for the pursuit of this interest.)

3. Autonomy is related to the satisfaction of needs. Disregarding the basic physiological needs, there is the need to have interests, the need to affiliate to a peer group and the need to achieve. (Implicit in this is provision of facilities to meet the needs of individuals either at school or in the community in which they live.)

4. The development of personal autonomy is linked with the development of moral standards. The individual must be able to make moral judgements about events or people. This point implies that

teachers and other people influencing the lives of young people must be prepared to take a moral standpoint on issues that may also affect the lives of the young people. In this connection the standpoint must be backed up by facts that have been well substantiated and which are relevant to the issue in question. (This ties in with the first point relating to the acquisition of knowledge.)

To sum up Harris's point of view : education should cater for the "total" child in the "total environment". In other words, in striving for the development of personal autonomy in individuals, the educational programme is also working towards the best working relationship between an individual and his total environment. Since the individual is constantly interacting with his total environment, it may be said that education has a definite role to play in ensuring the best kinds of relationships for both the individual as well as his environment. This point of view is of particular significance when Environmental Education is discusses.

It is of significance to note that at least one college of education, the Johannesburg College of Education, has the development of personal autonomy as one of its prime objectives for its students (Johannesburg College of Education, 1978:2).

2.3.6 Summing up of education

In summarising the discussions on education, the following points may be made :

(i) The general aim of education is to lead a person into adulthood within a particular culture.

(ii) Education is concerned with the development of the "total" child.

(iii) In deciding on specific subject objectives consideration must be given to the development of the child within his society. The objectives must be compatible with the culture in which the schooling is taking place.

(iv) School education must assist with the development of personal autonomy.

2.4 ENVIRONMENTAL EDUCATION

It has already been established that the individual is constantly interacting with his total environment. Since this environment consists of cultural as well as bio-physical elements, it follows that whatever the child learns at school will have some bearing on, or reference to, some aspects of this environment. In this sense then it is apparent that all school subjects have some information to pass onto the child about the environment, and thus contribute to some extent to "Environmental Education". However, in order to discuss the contributions made by Geography and Biology teaching in the field of Environmental Education it has been necessary to consider the nature of Environmental Education more precisely, and for this reason discussion is included here.

Most writers involved with Environmental Education emphasise the unity of man and his environment. Smyth (1977:103) describes the primary function of education as "providing man with the skills, knowledge and understanding to live successfully in his world", and sees Environmental Education as an important part of general education with the specific function of providing

recognition "of the interdependence of man and environment in a single system". Stapp (1977:37) says that one of the major guiding principles for Environmental Education is that it should consider the environment in its totality "natural and man-made, ecological, political, economic, technological, social, legislative, cultural and aesthetic".

Another aspect of Environmental Education that receives constant emphasis from environmental educationists is that which deals with inter-relationships within the environment. For example Greenall (1977:42) notes that Environmental Education should lead to an understanding that "human beings are organisms and, like other organisms, are constantly interacting with their environment". Aldrich (1977:64) gives one of the goals of "environmentalised education" to stress the relationships and interdependencies between natural and man-made systems and needs". Emphasis is also placed on the fact that the man-environment relationship is the most significant of environmental inter-relationships with regard to the long-term health of the environment. The earth has been compared to a space-ship with an on-board crew (e.g. Combes, 1977:22; Brown, 1977:40). The health of the environment within the space ship depends on the crew, and health of the crew depends upon the health of the environment.

A final aspect of Environmental Education that has attracted attention from educationists the world over, is that Environmental Education programmes should be problem orientated. In this connection the orientation should not only be to the problem itself, but also to its solution. Mary Berry (1979:50) says that "no man or woman has the right to consider himself or herself an educated person until he or she understands something about the world in which we live, what harm we are doing

to the world, and what we can do to save it." Stapp 1977:37) gives as a goal of Environmental Education the emphasis of active participation in "preventing and solving environmental problems", while the U.S. Department of Health, Education and Welfare says that the process of Environmental Education "helps the learner perceive and understand environmental principles and problems, and enables him to identify and evaluate the possible alternative solutions to these problems and assess their benefits and risks" (Saveland, 1976:12).

Although there are numerous definitions of Environmental Education in the literature, there are two which seem to contain those elements which the international community seems to consider as essential to the concept. These are the definitions put forward by the International Union for the Conservation of Nature (IUCN) (Cerovsky, 1971:17), and that contained in the United States Environmental Education Act of 1977 (Nightingale, 1977:6).

The IUCN definition reads as follows :

"Environmental Education is the process of recognising values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the inter-relatedness among man, his culture and his bio-physical surroundings. Environmental Education also entails practice in decision making and the self-formation of a code of behaviour about issues concerning environmental quality."

The American definition reads :

"Environmental Education is an integrated process which deals with man's interrelationship with his natural and man-made surroundings, including the relationship of population growth, pollution, resource allocation and depletion, conservation, technology and urban and rural

planning to the total human environment.

Environmental Education is a study of the factors influencing ecosystems, mental and physical health, living and working conditions, decaying cities, and population pressures. Environmental Education is intended to promote among citizens the awareness and understanding of the environment, our relationship to it and the concern and responsible action necessary to assure our survival and to improve our quality of life."

The ICUN definition has been criticised as being too "conservation" orientated (Nightingale, 1977:6). He gives two areas of criticism of this definition. The first is the criticism of third world countries that the definition implies conservation "by, and on behalf of, the middle classes of the third world" and the second is that of some educationists who hold the view that the definition is orientated to the bio-physical world and rural areas, whereas it should include more aspects of the socio-cultural environment and urban areas. The writer is in agreement with this criticism since he feels that the environment should be investigated in its totality, and feels that Environmental Education should therefore be as broad-based and multi-disciplinary as possible. For this reason the United States definition is accepted as the working definition for this study.

2.4.1 The aims and objectives of Environmental Education

2.4.1.1 Long term aims

Some of the aims and objectives for Environmental Education were discussed in the previous section. The Belgrade Charter of 1975 (UNESCO-UNEP, 1976:2) gives the goal of Environmental Education as "to develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skill, attitudes, motivations and commitment to work individually and collectively towards

solutions of current problems and the prevention of new ones". Smyth (1977:107) gives similar aims in stating "(Environmental Education's) aim is to enable people to recognise the factors which determine the nature and quality of their environment so that they may respect and appreciate it to the full, and participate constructively in its management and development."

Harvey (1976:67) sums things up nicely by giving a single, superordinate goal for Environmental Education as the achievement of "a homeostasis between quality of life and quality of environment."

The views expressed by Smyth, Harvey and in the statement made in the Belgrade Charter, are in agreement with the concept of "space-ship earth" discussed in 2.4. This underlines the fact that Environmental Education should be concerned with the close man-environment inter-relationships that inevitably affect the quality of the environment as the home of man.

2.4.1.2 Objectives

The Belgrade Charter lists six objectives for Environmental Education (UNESCO-UNEP, 1976:2). These are :

1. Awareness : to help individuals and social groups acquire an awareness of and sensitivity to the total environment and its allied problems.

2. Knowledge : to help individuals and social groups acquire basic understanding of the total environment, its associated problems and humanity's critically responsible presence and role in it.

3. Attitude : to help individuals and social groups acquire social values, strong feelings of concern for the environment and the motivation for actively participating in its protection and improvement.

4. Skills : to help individuals and social groups acquire the skills for solving environmental problems.

5. Evaluation ability : to help individuals and social groups evaluate environmental measures and education programmes in terms of ecological, political, economic, social, aesthetic and educational factors.

6. Participation : to help individuals and social groups develop a sense of responsibility and urgency regarding environmental problems to ensure appropriate action to solve those problems.

Harvey (1976:67) identifies three main objectives for Environmental Education. The three, which he calls subordinate goals to the superordinate goal mentioned earlier, are :

(i) The development of environmental literacy where this means the possessing of basic skills, understnading and feelings for the human environment. Here the emphasis is on knowledge.

(ii) The development of environmental competency where this means the ability to use environmental literacy to apply, analyse, synthesise and evaluate knowledge. Environmental competency also implies values consistent with the subordinate goal mentioned earlier. Here the

emphasis is on attitudes.

(iii) The development of environmental dedication whereby a person who has both environmental literacy and competency acts consistently in a manner compatible with homeostasis between quality of life and quality of environment. Here the emphasis is on behaviour.

Both sets of objectives may be related to the educational objectives suggested by Bloom and his assoicates (Bloom, 1956:201-207; Kratwohl and Bloom, 1964:176:185) which were discussed in section 2.3.3. Each may be classified either as a cognitive objective or as an affective objective. With regard to the Belgrade Charter objectives 1, 2 and 4 may be classified as cognitive, while the remainder are affective. In the case of Harvey's objectives the first is a cognitive objective, while the remaining two could be classified as affective. From this it is clear that both sets of objectives take into account the informational and training aspects of Environmental Education; as well as the development of sound attitudes and positive behaviour which it results in.

2.4.1.3 Organisational and/or developmental strategies

It is necessary to discuss briefly the organisational and/or developmental strategies which may be necessary to ensure good Environmental Education in the school system. They may be divided into two broad categories. These are inclusional strategies and organisational strategies (Hurry, 1980:4-5).

(i) Inclusional strategies are those strategies aimed at having more Environmental Education

included in the existing school programmes. Strategies in this category will include improved teacher training, the provision of resource materials, a re-appraisal of work divisions (time-tabling) and a more efficient use of resources (such as school grounds).

(ii) Organisational strategies are those strategies actually required to run specific Environmental Education programmes. They include teaching methodologies, pupil involvement and evaluation of Environmental Education programmes.

2.5 HOLISTIC ENVIRONMENTAL EDUCATION

2.5.1 Introduction

The concept of totality in education has already been discussed. It has been used to describe the "whole or total child". Education should cater for the total needs of the complete child.

The concept of personal autonomy has also been discussed. This has been suggested as the over-arching aim for all education. An individual who has achieved personal autonomy has developed his or her full potential within the environment in which he or she lives. Personal autonomy also implies that the individual is able to make moral judgements with regard to other people or to the environment.

Finally, the term "Environmental Education" has been discussed with regard to the understanding of environmental structures and processes, and to the development of positive behaviour patterns which reflect sound attitudes and beliefs concerning the environment.

Marsden (1976:9-11) has pointed out that an individual requires both knowledge and insight into issues if he or she is to make value judgements about them. In the case of Conservation Education the inference is that the individual should acquire knowledge and insight of the complex bio-physical environment in order to make value judgements about issues within this area. Since the bio-physical environment is a complex system of structures and processes, it would seem a Herculean task to gain knowledge and insight into it. It is suggested that the best approach for overcoming difficulties in this regard is the holistic approach, and for this reason it is discussed in some detail here.

2.5.2 The concept of holism

The holistic approach is based on a concept of holism that originated in the 19th century. The word "holism" is derived from "wholes". It refers to a philosophy of seeing things in the environment as "wholes" or complete units. It is not known who first coined the term, but it has been in use since the latter part of the 19th century, particularly in the fields of philosophy and biology (Haldane 1884:27-47, Montgomery 1880:318-336). Proponents of holism in the 20th century include Jan Christian Smuts (1926), A.N. Whitehead (1929) and D.C. Phillips (1977).

The holistic approach stresses the view that the environment is a complete entity, and that the completeness or "wholeness" of the environment has attributes and characteristics that are more than just the sum of the parts. This concept may be compared with the "gestalt" theory of perception (Koffka, 1962; Köhler, 1969) which holds that all perception (and hence learning) starts with "wholes" rather than with simple parts.

The "wholes" (named"gestalts" by the German psychologists) provide a reference framework by which we interpret our environment. An important aspect of gestalt psychology is that the "whole" is more than merely the sum of all of its parts. This "wholeness" is the result of particular relationships which exist between the parts. For example, all the parts of a bicyle lying loose in a box do not make up a bicycle until they are assembled in a particular way. In the same way an ecosystem has a particular set of characteristics which only exist because of the peculiar relationships between its elements. Perception of the ecosystem as a "whole" rests with the fact that the ecosystem is seen as a "gestalt" and not as an assemblage of different parts.

Opponents to holism (Madden, 1962:126; Nagel, 1966: 132-141) hold the view that it is impossible to comprehend the whole without first understanding the parts. They maintain that the best approach is the analytical or mechanistic method whereby a picture of the whole is built up through a careful study of the parts. (For example in studying an ecosystem, the scientist would identify all the components and through studying each, would build up a picture of the complete system.) The mechanistic approach would seem to be in agreement with traditional teaching principles of "proceeding from the known to the unknown," proceeding from the simple to the complex" and proceeding from "the concrete to the abstract" (Engelbrecht and Lubbe, 1980:13).

Phillips (1977:71) has pointed out that there are sound arguments for both the holistic as well as the mechanistic approach to a study of the environment. A major problem with regard to the holistic approach is the size of the "wholes" to be studied. If an individual needs to understand the whole of his environment before he can appreciate the parts, there

would never be any understanding. He quotes Bertrand Russell as saying "if all knowledge were knowledge of the universe as a whole, then there would be no knowledge." (Phillips, 1977:11). On the other hand, Phillips points out, the environment is undeniably a "whole" entity and that subtle interactions between the elements in the environment create wholes which are more than just the sum of the parts.

Phillips suggests that the concept of holism relates not so much to the idea that there is one complete, indivisible "whole" (i.e. the complete environment stretching off into infinity) but to the idea that there is a hierarchy of "wholes" which nest within one another. He refers to the use of the word "holon" which Koestler uses in the field of behavioural psychology. A holon is a "whole" within a system of other wholes. Seen from a point of view below it in the system it is a self-contained whole; seen from a point of view above it, it is a dependent part of another, larger, whole whole (Phillips 1977 : 70-71). This concept would seem to agree with Smuts' view of "wholes" and "holism" (Smuts, 1926:110-117). He sees a "whole" as being an integral part of the total environment. A "whole" consists of an organism within a "field" of influence. The size of the field is determined by the existence of factors which play a significant role in the life of the organism. The concept of holism is related to an investigation of larger and larger "wholes" synthesised together to form a true picture of reality. Smuts is not opposed to the mechanistic approach since it yields good results from the point of view of knowledge, but states that knowledge gained in this way must not be an end in itself (Smuts, 1926:145-181).

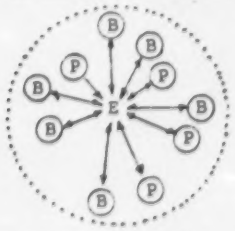
2.5.3 Holism and holistic education

In this study the concept of holistic Environmental Education is based on the views of Smuts and Phillips. It is accepted that there must be an element of the mechanistic approach to environmental studies (particularly in the light of basic teaching principles), but it is suggested that the concepts of "holons" and "fields" can be used to provide a compromise approach between pure mechanism and pure holism.

The following definition of holistic Environmental Education is proposed : Holistic Environmental Education is the study of the components of the environment with the aim of building a comprehensive picture of the environment as a whole. In studying the components special reference is made to the relative position of each component within the environment, as well as to the factors which affect, or are affected by, the component being studied.

2.5.4 Holistic education and subject integration

FIGURE 8 : RELATIONSHIPS WITHIN THE ENVIRONMENT



E = Part of the environment being studied.(Could be bio-logical or non-biological.)

⟷ = Inter-relationships

—— = Holon of part E.

B = Biological elements
P = Non-Biological (Physical) elements.

Information for the Biological elements comes from : Botany,Zoology,Biology,Ecology,etc.

Information for the Non-Biological elements comes from : Geology,Hydrology,Geomorphology,Physics,Chemistry,etc.

Figure 8 shows the potential relationships which could exist between one component of the environment and the rest of the environment. From the figure it is clear that an holistic study of any one environmental component involves information from a variety of sources.

In the case of school education this implies a certain amount of subject integration*, in that information (or techniques for obtaining and recording information) is available from subjects such as Geography, Biology, Science, Mathematics and History. Several writers have pointed out that subject integration, at different levels of application and according to the needs of the programme, is essential if the programme is to be holistic (e.g. Rimer, 1980:17-30; Hopkins, 1976:25; Millar, 1980:7; Stapp, 1978(b):5; Fensham and May, 1979:15-24).

In calling for improved subject integration at school writers are not calling for a break down in the system of separate school subjects, or for a distinct school subject known as Environmental Education. Emphasis is rather placed on the fact that each of the school subjects has a role to play in developing positive attitudes to the environment, and in achieving the aims and objectives of Environmental Education as set out earlier. Nightingale (1977:29) points out that "though environmental studies has not been recognised as a separate subject in Secondary schools in South Africa, some of the aims of environmental education can be promoted by simply placing greater emphasis on matters of environmental concern." The school subjects do not lose their identity, aims or objectives, but are used as a vehicle for achieving environmental awareness.

*In this study the term "subject integration" is used synonymously with the term "integrated studies" as defined in the International Dictionary of Education : "Integrated studies (are) studies involving and linking work in different school subjects." (Page and Thomas, 1977:179).

Stapp (1978 (b):5) has pointed out that the subjects themselves should benefit from subject integration which can link subjects together, add new dimensions to subjects and provide relevance for existing curricular material.

Finally Lawton (1973:139-142) suggests that, at any level of inter-disciplinarity of school subjects, the situation could be effectively used in problem solving situations. He suggests that there are three "phases" of education. The first phase, in the junior school, is the pre-disciplinary phase in which there is no emphasis on specific subjects and the topical approach to environmental studies is used. The second phase is the single discipline phase. This occurs when emphasis is placed on single school subjects (usually from Senior Primary phase onwards). The third phase is the inter-disciplinary phase where subject integration is used to solve problems. This last phase should not be a separate phase in the curriculum, but should be blended in with it. This should not come at any particular year of study, but should be gradually introduced at various levels depending upon the abilities of the pupils.

The writer suggests that it would be relatively simple to develop a system of optimum subject integration at Secondary schools. All that is required is that teachers of subjects such as Biology and Geography should meet from time to time to discuss areas of overlap or common interest at the various levels. A strategy could then be worked out between the relevant teachers for the teaching of those sections of the work. In this respect the Heads of Department for Biology and Geography should initiate such communication and co-operation and assist with the planning of the lessons or activities involved.

A final word in this connection is that co-operation between teachers should not be limited to Environmental Education or to Geography or Biology. There is scope for co-operation between subjects such as Mathematics and Science, Science and Biology and many others.

2.6 ENVIRONMENTAL EDUCATION AND FIELDWORK

A number of writers have stressed the basic didactic principle of environmental teaching (e.g. Engelbrecht and Lubbe, 1978:12-21; Duminy and Söhnge, 1980:46-47). According to this principle the environment must be used as a major source of information and inspiration in the didactic situation. The child is reared in a particular environment with which he is constantly interacting. The information that he receives is largely diffuse and unarranged, and the school's task is to help him arrange the information meaningfully while at the same time extending his knowledge of it. This principle is linked to another educational principle, namely moving from the known to the unknown, which stresses the fact that knowledge can only be acquired if it is based on known information (Engelbrecht and Lubbe, 1978:19).

A number of writers have stressed the need for fieldwork activities (i.e. activities in the environment) if Environmental Education is to be effective (e.g. Berry, 1975:123-126; Nightingale, 1977:10; Jernigan & Wiersch, 1978:30-35 and Clayton, 1979:10-11). Nightingale (op. cit.:22-23) lists the arguments in favour of fieldwork as an integral part of Environmental Education. These may be summaries as follows :

(i) Fieldwork provides a training in the accepted methodologies of the natural sciences. It is a scientific method of investigation.

(ii) Fieldwork is an important means of developing the critical faculty of pupils. By obtaining information at first hand they are able to obtain information for themselves, record data and hypothesise on the data collected. They will also be able to compare their hypotheses with those of other people and to draw conclusions about both the scientific method and the results obtained.

(iii) Fieldwork develops an understanding of the terms and concepts which they may have heard in the classroom. Introducing them to concrete examples provides them with a ready frame of reference and assures common standards of comparison within a group. Most important, fieldwork reduces the risk of misconceptions of environmental terms. It should be the intention of every teacher that no concept in Natural Science or Geography should be taught without relating it to reality. (This point has to do with the basic didactic principle that learning should always proceed from the concrete to the abstract (Engelbrecht and Lubbe, 1978:15)

(iv) Fieldwork enables teachers of natural science subjects to make their subjects come alive.

(v) Fieldwork provides training in intelligent observation. It is not enough for a child merely to see things in his environment. He should be able to comprehend the patterns of elements and interactions which are found at different levels of complexity about him.

(vi) Children learn best by doing. Fieldwork provides the vehicle for activities through which the child learns more about his environment. (This is to do with the didactic principle of activity and self-activity. "Education is only successful if there is activity on behalf of the pupil" (Engelbrecht and Lubbe, 1978:16).)

(vii) Fieldwork enables children to work at their own speed and to develop a sense of responsibility because of this.

(viii) Fieldwork is seen as playing an important role in producing in pupils a concerned interest in the environment in which they live, which will often mature into a commitment to conservation and a sense of responsible citizenship.

To Nightingale's list could be added that fieldwork provides an opportunity for meaningful experiences for the child. The child is able to use all his mental faculties during the experience. This gives him confidence in his own ability and underlines for him the fact that learning can come from within. Such meaningful experiences thus contribute to the development of the child's personal autonomy.

A number of "spin-off" benefits can also be claimed for fieldwork activities (Nightingale, op.cit.). These include the sociological development of the child (an important aspect of his "total"development) with improvements in inter-relationships within the pupil group as well as between the teacher and the pupil. It may also play a part in building the character of the pupil, and introducing children to worthwhile leisure activities. (This point has been discussed with regard to the development of personal autonomy earlier in this chapter.)

2.7 CONSERVATION EDUCATION

From what has been said in the previous sections, it is apparent that Environmental Education is a multi-faceted process, and that a sound Environmental Education programme would involve a wide range of topics. Since it is convenient to divide the human environment into two spheres, namely cultural sphere and the bio-physical sphere (see section 2.2), it is also convenient to discuss Environmental Education under similar headings. In this study the emphasis is mainly on education relating to the bio-physical elements in the environment. To simplify discussion, a secondary education process, namely Conservation Education, is identified.

A number of writers have stressed the need for education programmes which concentrate on the bio-physical elements in the environment (e.g. Swan, 1975:7-8; Downing, 1977:1; Stapp, 1978(b):1-3; Clayton, 1979:113). They see a pressing urgency for education to involve itself more with issues concerning the health of the bio-physical world. They point out that population numbers are exploding (in South Africa the population will double over the next 20 years), and that natural resources such as air, water, soil, wood and minerals need to be wisely used if the needs of future generations are to be met.

Clayton (1979:113) states that "education, especially environmental education (sic), is regarded by many as the only major means available to man to combat environmental deterioration."

Nightingale (1977) sees (environmental) education as necessary to "deepen....understanding of the essential oneness of man and his environment." He stresses the fact that the population explosion and rising standards

of living are placing increasing strains on the bio-physical world. He quotes Ripley and Buechner (1971: 134-142) as saying that "one of the most critical problems facing humanity today is an ecological one of relating human societies harmoniously to their environment" and sees that education has a vital role to play in confronting people with these problems and their implications.

To distinguish between Environmental Education (which encompasses the total human environment) and education which concentrates on the bio-physical environment, the term "Conservation Education" is used (Downing, 1977:1). According to Downing (op.cit.), Conservation Education is primarily orientated towards "the long-term future and the peaceful comfortable survival of mankind." She describes it as having the aim of developing adults "who possess a deep sense of responsibility towards the earth and all living things" and who believe, inter alia in "the wise management of natural resources and the need to initiate and implement action to improve environmental quality." In this connection the IUCN definition of Environmental Education (given in section 2.4) may be seen in fact as a definition of Conservation Education, by simply replacing the term "Environmental Education" with Conservation Education. The definition then reads :

"Conservation Education is the process of recognising values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the inter-relatedness among man, his culture and his bio-physical surroundings. Conservation Education also entails practice in decision making and the self formulation of a code of behaviour about issues concerning environmental quality."

It is important to stress that Conservation Education is not a separate form of education from Environmental Education. It must be seen as an aspect of Environmental Education which is receiving emphasis. It is also important to note that both terms are used in this study, and that both are used stricly in accordance with the definitions proposed in this and the previous sections.

2.8 CHAPTER SUMMARY

This chapter deals with the concepts of "Environment" and "Environmental Education".

The environment of an individual organism (human or non-human) consists of the sum of all external conditions and influences that affect the life of that organism. In the case of human beings the environment has two main components. These are the bio-physical component and the cultural component. An essential characteristic of the relationship which an individual has with his environment is that he or she is reacting to the total environment, and not just individual elements within it.

Education is a process whereby an individual is brought to responsible adulthood with his particular environment (with its bio-physical as well as cultural components.) During formal schooling the aims and objectives for the various school subjects must be related, not only to the requirements of the subject, but also to the needs of the individual in his cultural and bio-physical environment. The development of personal autonomy is suggested as a sound over-arching aim of education, since this implies that the individual has both knowlege and ability, and that this helps him establish a sound working relationship with his total environment.

Environmental Education is an aspect of general education. (Some would argue that it should be the core theme of general education.) It is concerned with the development of a code of behaviour, based on knowledge, about issues concerning the health of the total environment.

Holistic Environmental Education emphasises the wholeness or completeness of the environment. Although individual components are studied, they are studied in relation to the unity of the environment. Holistic environmental education emphasises relationships in the environment, so that the elements and the relationships between them form the field of study. Since it is impossible to study (or comprehend) the entire environment, use is made of the concept of holons. A holon is a unit of the environment with a focal point (which could be an organism, a piece of rock,or an ecosystem or any other definable entity). All the important factors affecting the focal point make up the holon.

School subjects, in order to be more holistically taught, need to be integrated. The measure of integration would depend upon the school system, or nature of the holon. Subject integration does not mean a loss of identity of the various subjects. There should rather be a greater degree of co-operation between relevant subjects either on common topics, or where supplementary information may be available from one subject for work being done in another. Various workers have shown that subject integration of this kind is necessary for effective Environmental Education. Not only does it encourage an holistic view of the environment, but it also encourages pupils to be problem orientated by giving them insights into the various topics they study.

Fieldwork is an integral part of Environmental Education. In addition to giving the child first hand experience of concrete objects and relationships in the environment, it also encourages the development of responsible attitudes and behaviour towards it.

Since this study deals primarily with studies of the bio-physical environment, a secondary Environmental Education process, known as Conservation Education, is identified. Conservation Education deals primarily with the bio-physical components of the environment.

CHAPTER THREE

ENVIRONMENTAL EDUCATION AND SCHOOL SYLLABUSES

3.1 INTRODUCTION

In this chapter an attempt will be made to assess the potential of Biology and Geography for Environmental Education through a study of the school syllabuses.

In the first place the aims and objectives of each subject will be examined in the light of discussion on the aims and objectives of Environmental Education.

Secondly the contents of each subject will be assessed in the light of the discussion on the nature of Environmental Education.

Where weaknesses have been identified, either in the aims and objectives, or in the contents of the syllabus, suggestions have been made as to how these may be corrected.

3.2 BIOLOGY AND GEOGRAPHY AS SCHOOL SUBJECTS IN TRANSVAAL SECONDARY SCHOOLS

In this study Transvaal Secondary schools are defined as schools which cater for standards 6 to 10, and which fall under the direct control of the Transvaal Education Department.

The Secondary school is divided into two phases. These are the Junion Secondary phase (standards 6 and 7) and the Senior Secondary phase (standards 8, 9 and 10).

Schools in the Transvaal Education Department (as in other education departments in South Africa) have a limited number of subject choices in the secondary school. In the Junior Secondary phase all pupils take both Geography and Biology (the latter as part of General Science). In the Senior Secondary phase pupils may take Geography and/or Biology (or neither) depending on the groupings of subjects offered at each school.

Table 2 shows the numbers of pupils who took Biology and/or Geography in Standards 7, 8, 9 and 10 in 1979 (provisional figures only). Table 3 shows the numbers of candidates who wrote Biology and/or Geography in the 1979 end of year Transvaal Senior Certificate examination.

TABLE 2 : PUPILS TAKING GEOGRAPHY AND/OR BIOLOGY (HIGHER AND STANDARD GRADE) 1979

(Source : T.E.D. (Provisional figures only))

	Std 7	Std 8	Std 9	Std 10
Geography pupils	40 159	8 911	7 948	6 391
Biology pupils	40 159	17 453	15 720	12 943
Total pupils in Standard	40 159	36 970	30 675	24 736
% pupils taking Geography	100	24	26	26
% pupils taking Biology	100	47	51	52

TABLE 3 : PUPILS WHO WROTE GEOGRAPHY AND/OR BIOLOGY IN THE TRANSVAAL SENIOR CERTIFICATE EXAMINATION (HIGHER AND STANDARD GRADE) NOVEMBER/DECEMBER 1979

(Source : T.E.D. (Provisional figures only)

Pupils who wrote Geography only	2 539
Pupils who wrote Biology only	9 657
Pupils who wrote BOTH Geography and Biology	4 318
Total pupils who wrote Geography and/or Biology	16 514
Total pupils who wrote the Transvaal Senior Certificate Examination	22 430
% Pupils who wrote Geography only	11
% Pupils who wrote Biology only	43
% Pupils who wrote BOTH Geography and Biology	19
% Pupils who wrote Biology and/or Geography	73

From these two tables a number of significant points emerge :

(i) The total number of pupils for each class level decreases sharply with each year in the Senior Secondary school.

(ii) More than twice the number of pupils took Biology as took Geography in the Senior Secondary phase.

(iii) In Standard 10 (the only year for which statistics were available) only 19% of all pupils took BOTH Geography and Biology.

(iv) In Standard 10 a total of 73% of pupils took either Biology or Geography or both.

3.3 THE AIMS AND OBJECTIVES OF BIOLOGY AND GEOGRAPHY

3.3.1 Introduction

The syllabuses for Junior Secondary General Science and Geography as well as those for Senior Secondary Biology and Geography are contained in separate booklets published by the Transvaal Education Department (T.E.D. 1972 and 1977). The booklets are intended, not only to itemise the content material of the various syllabuses, but also to give guidance to teachers of the subject.

All four syllabuses contain the general and specific aims for each subject. In many cases these aims help to "steer" the subject in a particular direction, or to assist teachers in deciding on areas of emphasis.

In this section an analysis is made of those aims which are considered to be related (directly or indirectly) to Environmental Education in general or to Conservation Education in particular. In this regard Harvey's aims for Environmental Education (discussed in section 2.4.1.1) are used as a basis for comparison. In this context therefore the aims of the syllabuses will be assessed in terms of environmental knowledge, environmental attitudes and environmental behaviour.

3.3.2 Preliminary discussion

Table 4 summarises the analysis made of the aims and objectives of Biology and Geography in the secondary school syllabuses. The assessments made in this table relate to the contribution of each aim or objective to the improvement of environmental knowlege, attitudes or behaviour. Each assessment was made, subjectively, by the writer. It has been difficult to decide whether an aim has direct or indirect benefit for Environmental

TABLE 4 : SUMMARY OF AIMS OF THE BIOLOGY AND GEOGRAPHY SYLLABUSES THAT ARE RELEVANT TO ENVIRONMENTAL EDUCATION

(For explanation of symbols see foot of table)

Number of aims contributing to :	BIOLOGY				GEOGRAPHY			
	Junior Sec.		Senior Sec.		Junior Sec.		Senior Sec.	
	G	S	G	S	G	S	G	S
Environmental Knowledge (Cognitive domain)	5(1E)	6(2E)	7(0E)	5(1E)	3(1E)	4(0E)	4(2E)	8(1E)
Environmental Attitudes (Affective domain)	3(1E)	4(2E)	12(5E)	0	4(0E)	1(0E)	5(3E)	1(0E)
Environmental Behaviour (Affective domain)	0	2(1E)	3(0E)	0	0	0	0	0
None of these	1	0	0	0	0	0	0	0
Total aims	9(2E)	12(5E)	22(5E)	5(1E)	7(1E)	5(0E)	9(5E)	9(1E)
Totals per syllabus	21(7E)		27(6E)		12(1E)		18(6E)	

Explanation of symbols

G : General aim

S : Specific aims and objectives

(E): Aims or objectives which are more directly related to Environmental Education (as defined in this study). The number of these aims is included in the figure before the bracket.

Education, and for this reason it will be seen that most aims are acknowledged as being of some benefit. (The number before the bracket in each column indicates the number of aims that relate directly or indirectly to the domain in the left column). It will also be seen, however, that relatively few aims have been assessed as having direct, obvious benefits for Environmental Education. (The number of aims with direct benefits is shown in parenthesis after each number in the various columns. The letter E next to each of these aims serves to identify them further.) When an aim has been assessed as contributing to more than one aspect of Environmental Education all were recorded for that aim, and the numbers were taken as separate numbers for the sake of the grand total. (Full details of the assessment may be found in Appendix A.)

3.3.3 Discussions on the aims of Biology (T.E.D., 1972 &1977)

In this section these aims are discussed in the light of the aims and objectives of Environmental Education. These have been summarised (in the previous chapter) as environmental knowledge, environmental attitudes and environmental behaviour. The aims are also assessed with regard to other elements of good Environmental Education such as holistic teaching and the inclusion of fieldwork in educational programmes.

3.3.3.1 Environmental knowledge

The general and specific aims of Biology emphasises subject knowledge, and the skills required to obtain this knowledge. Emphasis is also placed on the use of knowledge in other learning situations. For example section 1.2 of the Junior Secondard syllabus gives as an aim of Biology "to develop an inquiring mind, an interest in and a desire for personal investigation of

natural phenomena." Section 1.7 of the same syllabus has the aim: "to afford pupils the opportunity for planning and carrying out independent investigations either individually or in groups, and to discuss their findings." The Senior Secondary syllabus, section 1.1.2, gives an aim of Biology as "the development of patterns of behaviour associated with inquiry skills which lead to the effective scientific methods of solving problems."

The aim of both syllabuses contain aspects of holistic education. The Junior Secondary syllabus contains three aims which are relevant in this respect. Section 2.3 has the aim "to familiarise pupils with the inter-relationship that exists between man, other living organisms and the environment" and section 2.6 has "to make pupil's aware of man's role in the environment." The Senior Secondary syllabus has two aims stressing an holistic approach. Section 1.1.1 states a general aim for Biology as "the development of an understanding of the meaning of the basic unifying themes of biology by learning relevant facts, concepts and generalisations." Section 1.2.2 has "to show the interdependence between the organisms and between organisms and their environment."

3.3.3.2 Environmental attitudes

The aims of the syllabuses show a degree of commitment to the development of positive attitudes towards the environment. Positive attitudes to the subject (Biology) and to nature conservation are mentioned.

Section 1.1.1 of the Senior Secondary syllabus implies that "an understanding of the meaning of the basic unifying themes of Biology" develops positive attitudes to the subject, while section 1.1.3 of the same syllabus has an aim "the acquiring of positive values which

underlie the biological sciences". Through the development of positive subject attitudes positive environmental attitudes may possibly develop.

With regard to nature conservation the Junior Secondary syllabus has the aim "to develop a respect for, and a sense of responsibility towards nature and the utilisation of natural resources" (section 2.1). The Senior syllabus has a similar aim (section 1.1.3.7): "to develop a feeling of responsibility for nature and the preservation of natural resources." A problem of expressing the aims in this way is that pupils are encouraged to see "nature" as something separate from themselves. (This is a problem that has bedevilled education since time immemorial.) It would have been preferable if the aims could have been orientated to the total human environment rather than to the "natural" component, although this would form an integral part of it. In this respect aim 2.6 of the Junior Secondary syllabus : "to make pupils aware of man's role in the environment" is closer to the mark, although it deals with a one-sided relationship rather than an integrated one. (It is significant to note that section 2.4 of the contents of the Senior Secondary syllabus, entitled "Man and the ecosystem" contains only two sub-sections. The first calls for the study of "at least two examples of air, water and land pollution to stress the need for nature conservation"; and the second is related to the need to conserve indigenous fauna and flora. Both of these have a strong element of "nature conservation" as opposed to "environmental conservation" and reflect again the tendency to separate man from "nature".)

An improvement to the list of aims and objectives would be the inclusion of a general aim related to the total human environment. Such an aim might read :

> The cultivation of an awareness of the unity within the human environment, and recognition of the fact that man is as much an integral part of the environment as other bio-physical components.

3.3.3.3 Environmental behaviour

Within the context of this study the term "environmental behaviour" is used to describe activities or actions related to Environmental Education in general or Conservation Education in particular.

Five aims have been assessed as being directly linked to environmental behaviour. Of these three may be said to be directly related to Conservation Education (namely 2.2 in the Junior Secondary syllabus and 1.1.3.3 and 1.1.3.7 in the Senior Secondary syllabus). Of these three only one is stated in behavioural terms. This is aim 2.2 of the Junior Secondary syllabus which reads "to cultivate the habit of handling organisms with discretion." The other two are rather general and rely on inference to suggest behaviour. 1.1.3.3 reads "(the acquisition of) a desire to make one's own observations and to make independent observations", while 1.1.3.7 reads "(the acquisition of) a feeling of responsibility for nature and the preservation of natural resources."

The expected behaviour at the end of a programme of learning must have an effect on the nature of the programme (especially with regard to fieldwork), and there is a need for some aims to be stated in more definite behavioural terms if Biology is to be more effective in the field of Conservation Education. The following are suggested aims which could be most usefully incorporated into the aims of the Biology syllabuses (both Junior and Secondary syllabuses) :

> To develop an appreciation for the finite nature of the earth's resources and of the need to play an active part in their wise use.
>
> To bring home to young people that man is an integral part of the bio-physical environment, and to encourage them in their daily actions and activities to play an active role in the maintenance of the health of their environment.

One of the aims of the Land Service movement (discussed in detail in Chapter 5) is also of relevance since it is stated in behavioural terms. Aim number 2 reads "to make our young people acutely aware of the dangers of pollution, (of water, of air, and of land in general), and to inspire them to active efforts to combat this menace." (Department of National Education, undated :3.)

3.3.4 Discussion on the aims of Geography (T.E.D. 1972)

As with the discussion on the aims of Biology the aims and objectives of Geography are discussed with regard to the aims and objectives of Environmental Education (namely environmental knowledge, environmental attitudes and environmental behaviour) and are also assessed in the light of other elements of good Environmental Education, such as holistic teaching and the inclusion of fieldwork in educational programmes.

3.3.4.1 Environmental knowledge

As in the case of Biology, the general and specific aims emphasise subject knowledge in the Junior Secondary school. Emphasis is also placed on the skills required both to obtain knowledge and to use it in further learning

situations. Of the nineteen aims related to the acquisition of knowledge, four are directly linked to Conservation Education. In the Junior Secondary syllabus 1.1 stresses the interaction between "man and his environment". In the Senior Secondary syllabus 1.1 stresses the "interplay of phenomena"; 1.8 relates to problems facing mankind; 2.2 to the application of geographical knowledge and 2.3 refers to the aim of teaching "Geography as an applied science."

The Junior Secondary syllabus contains certain elements of holistic education. Section 1.1 stresses "the interaction of man and his environment", section 2.4 calls for an awareness of the world as a place "of infinite variety" and a knowledge of "some of the more outstanding kinds and patterns of variation ....", and finally section 2.1 deals with self activity in discovering for oneself the "inter-relationships of geographical phenomena." The syllabuses do not list or mention examples of what elements are present in "the outstanding kinds and patterns of variations", nor do they say what the "geographical phenomena" are. There is an inherent danger in these omissions that certain teachers will not know what to emphasise when it comes to an attempt to put an holistic picture across.

In the Senior Secondary syllabus both knowledge and the application of knowledge are stressed. An attempt is made at ensuring holistic teaching through the stressing of such aims as .. "To develop an understanding of the interplay of phenomena which give distinctive character to places ..." (section 1.1) and also "to stress the unity of knowledge through the links that Geography has with other subjects .." (section 1.5).

3.3.4.2 Evironmental attitudes

The aims of the Junior Secondary syllabus stress attitudes to geographical knowledge. Section 1.4 calls for the development of "a sense of reality in all their geographical work, while section 2.1 stresses the need to develop "a sense of discovery" in the acquisition of geographical knowledge, and an appreciation of independent study.

In the Senior Secondary syllabus there are five aims linked to environmental attitudes. Of these three may be said to be linked to Conservation Education. Aim number 1.6 is identical to 1.4 in the Junior Secondary syllabus. The syllabus also stresses the development of positive attitudes towards the application of knowledge. Aim number 1.7.1 sees the function of Geography as the training of future citizens "to imagine accurately the conditions of the great world stage and so help them think sanely about political and social problems in the world around them." Aim 1.7 suggests that through Geography the pupils will develop "a tolerance of attitudes ... to recognise and understand the problems of their own and other countries.." Finally aim number 1.8 is "to draw attention to the often crucial problems which mankind must face to provide for increasing population numbers and higher living standards." (This same section enumerates some of the problems, including provision of food, waste disposal, environmental despoilation and resource management.)

From this it may be said that the aims of Geography are more explicit than those of Biology with regard to the development of attitudes to the total environment. At the same time only problems are listed - not their solutions, so that attitudes developed through Geography

might be negative rather than positive. Just as there is a need to state the problems, so there is a need to examine the solutions. The aims of the Geography syllabus should place the same emphasis on problem solving as problem setting. In this way the syllabus could play a more dynamic role in helping to develop environmental awareness in those young people taking Geography as a school subject.

An example of a way in which an aim may be stated in more positive terms might read as follows :

> To draw attention to the often crucial problems which mankind must face in order to provide for increasing population numbers and higher standards of living, and to create opportunities for discussions and other activities (e.g. simulation games) aimed at suggesting solutions to these problems.

3.3.4.3 Environmental behaviour

As it was in the case of the discussion on Biology syllabuses, the term "environmental behaviour" is used here to denote activities or actions related to Environmental Education in general or to Conservation Education in particular.

It would appear that there are no aims related to behaviour in either the Junior Secondary or the Senior Secondary syllabuses.

Section 1.1 of the Junior Secondary syllabus states that the pupil who has followed the Junior Secondary course should be able to think and reason "geographically". It is not stated what sort of behaviour might be expected from the "thinking and reasoning".

In similar vein the Senior Secondary syllabus calls for

the development of "intellectual aptitudes" and an "awakening of geographical curiosity" (section 1.4). Again there is no mention of actions or activities that might flow from such developments.

As was discussed earlier in the section on attitudes the Geography syllabuses do list a number of aims related to the development of awareness of problems in the total world environment. It has also been mentioned that the problems, rather than their solutions are emphasised. The Geography syllabuses need aims, stated in behavioural terms, which will contribute to the solution of certain of the problems. With the excellent start made with the aims related to attitudes, the syllabus could easily include aims related to actions and activities flowing naturally from the acquired attitudes. In this context the suggested aims for the Biology syllabuses could be adapted for the Geography syllabuses (see section 3.2.3.3).

3.3.5 Environmental Education as a general aim of education

In this section we have discussed the aims and objectives of two school subjects, namely Biology and Geography. It would be valuable to consider the general aims for education (i.e. education across the board) as given by the Transvaal Education Department (March, 1973) :

> "Die algemene doelstellings vir die onderwys in sy geheel is die bemeestering van inhoude met die oog op die verwerwing van volwassenheid soos in die RSA geinterpreteer. Die besondere doelstellings (gedifferensieerde doelstellings) sal dui op doelstellings ten opsigte van, onder ander, verskillende vakke, en sal 'n verdere vertolking van die algemene doelstellings wees ..".

From the foregoing it can be seen that the T.E.D. sees school subjects as vehicles for developing the child to adulthood, and that, except for the enjoinder that education must be "Christian and National" there are no further guidlines on its general aims and objectives.

It would be of great value to the teacher if the T.E.D. could give more specific guidelines for general education. Not only would they indicate the general direction in which education should be moving more specifically, but they would encourage subject teachers to be more holistic in their approach. In this connection it is significant to note that the Department of Education and Training does give, in its booklet on primary school syllabuses, a list of general aims of education. These are as follows : (Department of Education and Training, 1967:ii)

(a) Physical

The development of a healthy body; the acquisition of some skill of hand and eye and a positive attitude towards practical work.

(b) Social

The development of sound standards of individual conduct and behaviour; and an understanding of the community, and of the individual's place in it.

(c) Mental

Training in mental skills such as reading, writing, spelling and mathematics; a working knowledge of English and Afrikaans; some knowledge of the world beyond the immediate surroundings.

(d) Spiritual

Training in the principles and practice of Christianity.

The merits or demerits of these general aims need not be discussed. The suggestion is merely that the formulation of such aims is a sound idea and that such general aims could be included in the principal's handbook for each school.

It will be noticed that there is no mention of Environmental Education in the above aims, and in this connection the following general aim is suggested :

(e) Environmental

The development of an awareness in the individual of his relationship and inter-dependence with the ecosystem of which he is an integral part, and the development of actions and activities in the individual which contribute to the continual health of that ecosystem.

3.3.6 Summing up of aims and objectives

Most if not all aims and objectives may be related in some way to Environmental Education (or Conservation Education). In the case of Biology 13 out of a total of 48 aims (i.e. 27%) could be said to be directly concerned with some aspect of Environmental Education. In the case of Geography 7 out of a total of 30 (i.e. 23%) of the aims could be said to be in the same category.

The proportion of aims that relate directly to Environmental Education is high. Nevertheless there is

a noticeable lack of aims or objectives that are stated in behavioural terms, and in this respect it is necessary either to replace existing aims with others, or to reformulate the existing ones. There is a particular need for aims which spell out the details of desired behaviour as a result of Biology and/or Geography programmes. Teachers are, in many instances, totally dependent on the syllabus for guidance, and the inclusion of aims stated in behavioural terms would give them the direction they need when teaching topics that are closely linked to Environmental Education.

Finally it is noted that there are no aims for general education which cater for Environmental Education. It is recommended that such aims be formulated and that they be included in the principal's handbook for each school.

3.4 THE CONTENTS OF SCHOOL SYLLABUSES FOR BIOLOGY AND GEOGRAPHY

3.4.1 The frame of reference

Biology and Geography are two school subjects which study different aspects of the environment, Geography may be defined as "the study of the diverse features on the Earth's surface, such as relief, climate, vegetation, soils, economic resources; their description, development, and distribution; and their interaction with man ..." (Buchanan, 1974:96). Biology may be defined simply as "the science of life, the main branches of which are botany and zoology" (Uvarove, 1973:48). From this it is clear that both subjects should contribute to Environmental Education in general and to Conservation Education in particular, if only with regard to factual information. In this study therefore emphsis will be

laid, not so much on the positive aspects of the syllabuses, but rather on the ways in which they may be improved to make optimum contributions to Environmental Education. In this respect the question of holistic education (discussed in detail in Chapter Two) is of greatest relevance.

Figure 9 is a simplified view of the human environment which emphasises the bio-physical components. In order to have an holistic view of the environment pupils should know something about each of the elements shown in the diagram, and more important, how the elements relate to each other. For this reason the diagram is used as a frame of reference in discussing the contributions of the various syllabuses to Environmental Education in general and to Conservation Education in particular.

In Figure 9 the following elements are shown :

A : The sun, the main source of terrestrial energy.
B : Green plants, the only living organisms capable of capturing solar energy.
C : Animals which feed on green plants (or on other animals) to obtain their energy.
D : The soil which provides green plants with substances essential to growth.
E : Organisms in the soil which convert plant and animal waste material into plant food.
F : Mountains and other geomorphological features which have an influence on, and are influenced by, other elements in the environment (climate, vegetation, soil etc.)
G : Sub-terranean rocks which weather to provide minerals for soil.
H : Open water surfaces which are the source of atmospheric moisture.

I : Atmospheric conditions that affect temperature, precipitation etc. (climate and weather).
J : Man who (in the biological sense) is an animal within the environment, but who does not always live in balance with it.

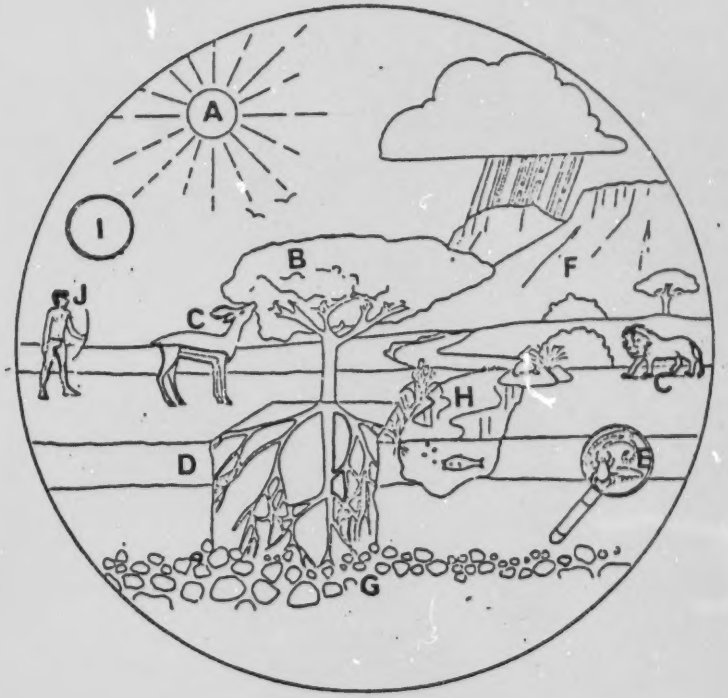


FIGURE 9 : THE HUMAN ENVIRONMENT (ECOSYSTEM)

TABLE 5 : SUMMARY OF TOPICS IN BIOLOGY AND GEOGRAPHY SYLLABUSES FOR STANDARDS 6 - 10

TRANSVAAL EDUCATION DEPARTMENT

BIOLOGY	GEOGRAPHY
Standard 6 1. Sorting, classifying & naming living things. 2. Reproduction of plants. 3. Growth & development (with emphasis on cells) in plants and animals. 4. Irritability (response to stimuli). Plants & animals.	Standard 6 1. Maps of the world - political & physical, 2. Principles of mapwork. 3. Astronomical & mathematical Geography (Solar system and the earth.) 4. Climatology 5. Major natural regions of the world (selected). 6. South Africa - Geographical study. 7. South West Africa. 8. The Southern Continents - Geography study (selected studies from South America & Australia). 9. Independent study topics.

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(Continued)

TABLE 5 : (Continued)

BIOLOGY	GEOGRAPHY
Standard 7 1. Nutrition - in plants and animals. 2. Respiration in plants. 3. The role of water in living organisms - plants and animals. 4. Nature conservation - ecosystem, food chains, the balance of nature, wise use of natural resources (air, water & animals, plants & soil). 5. The soil discussed in detail. Composition, formation, reduction in fertility. Pollution.	Standard 7 1. Principles of mapwork. 2. Astronomical & mathematical Geography. 3. Geomorphology - weathering & erosion. 4. Major natural regions (selected). 5. Regional studies (selected studies from Africa, Europe, North America and Asia). 6. Settlement Geography - rural & urban settlements. 7. Independent study topics.
Standard 8 1. Complementarity of structure and function : - at cellular level; - at tissue and organ level with special reference to human physiology.	Standard 8 1. Introduction to map analysis. 2. Introduction to photograph analysis. 3. Diagrammatic representation of statistics. 4. Climatology (theoretical & practical). 5. Geomorphology (theoretical & practical). 6. Human Geography - population Geography. 7. Regional Geography - selected studies of 1 technologically developed country and 1 technologically underdeveloped country. 8. Assignment work.

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(Continued)

TABLE 5 : (Continued)

BIOLOGY	GEOGRAPHY
Standard 9	Standard 9
1. Variety among living organisms. Viruses. Plant kingdon. Algae. Fungi. Bryophytes Spermatophytes - Angiosperms.	1. Climatology (theoretical & practical). 2. Oceanography. 3. Geomorphology (theoretical & practical). 4. Economic Geography - primaty, secondary & tertiary activities. 5. Regional Geography - selected studies of 1 technologically developed country and 1 technologically underdeveloped country. 6. Assignment work.
Standard 10	Standard 10
1. Variety among living organisms. The animal kingdon - examples from various groups. Introduction to taxonomy. The web of life - ecology. Similarities of structure & function at cellular level. Continuity of life.	1. Climatology (theoretical & practical). 2. Geomorphology - including soils and ecosystem concept. (theoretical and practical) 3. Settlement Geography - urban & rural settlements. 4. Regional Geography - South Africa. 5. Regional Geography - South West Africa. 6. Assignment work.

Table 5 summarises the main topics of the various syllabuses. The syllabuses have been separated according to class levels to facilitate comparison and discussion at each level.

3.4.2 Comments on both Biology and Geography

A study of the contents of the syllabuses for each standard reveals that there is no obvious correlation between Biology and Geography. This is a particular problem in the Junior Secondary school where pupils take both subjects. Although there are topics in the subjects which overlap (for example in Standard 6 the section on plant and animal classification in the Biology syllabus overlaps with the section on natural regions in the Geography syllabus) there is no guidance to the teacher of these two subjects (even in the form of a simple cross-reference) as to how the two topics could or should be correlated. Since research has shown (Hurry, 1978 (a):15) that Biology and Geography teachers seldom meet to discuss common-ground topics (in fact they may not even know what topics appear in each other's syllabuses) there is a strong possibility that no correlation at all will take place.

Although a relatively small proportion of Senior Secondary pupils take both Biology and Geography (according to Table 3 only 19% of all matriculants who wrote the T.E.D. senior certificate examination took both subjects) it is also essential that Geography and Biology be correlated in the Senior Secondary school. In the first place those pupils who take both subjects would have the opportunity to study the environment more holisticallym and in the second it would allow teachers who teach pupils taking only one of the subjects an opportunity to teach it more holistically by introducing suitable elements from the subject not being taken. For example in Standard 9 the Biology syllabus deals with "variety among living organisms" (with

special reference to plants). The Geography syllabus deals with factors affecting climate and aspects of landscape development under the influence of water, wind and ice. Here is an opportunity to discuss the influence of climate and topography (on a micro- and meso- as well as a macro-scale) on plant species and communities. The correlation need not involve many teaching periods (it could be done in a single period) but it does allow the Biology and/or the Geography pupil the opportunity to complete the "circle of information" and to create the total picture.

In order to improve correlation between Biology and Geography there are at least two improvements necessary to the syllabuses. The first is to write syllabuses which complement each other in certain areas (as in the Standard 9 example above) and the second is to include cross-references in the syllabuses for both sybjects.

3.4.3 Biology syllabuses and Conservation Education

Generally speaking the Biology syllabuses contain a wide range of topics which could enable the pupil to gain knowledge of certain aspects of the environment.

In Standards 6 and 7 the pupils learn a scientific approach to the study of the environment. The syllabus contains sections on classification, elementary plant and animal ecology and general ecology with emphasis on ecosystems. There are also sections on nature conservation and the wise use of natural resources. Missing from the syllabus are topics relating to climate (e.g. micro-climate) and geomorphology. Since these topics are listed in the Geography syllabus these omissions are not seen as a problem, providing there is some degree of correlation between the subjects. It is important to note that the Junior Secondary syllabuses contain notes on the "Suggested Approach" to each topic. These notes contain a number of suggestions which relate

directly to Environmental Education. For example in the Standard 6 syllabus reference is made to the importance of field observations in dealing with organisms, while in Standard 7 the teacher is encouraged to use local examples of ecosystems when dealing with the "balance of nature". The Standard 7 syllabus also stresses the "role of the citizen" in controlling pollution of natural resources.

In the Senior Secondary syllabuses there are no hints to teachers of the kind found in the Junior Secondary phase. In Standard 8 the syllabus deals mainly with complementarity between structure and function in different parts of plants and animals. Thus at this level only certain aspects of the living organisms in the environment are stressed. In Standard 9 the emphasis is on the variety of living things in the environment, with emphasis on plants. Each class of plants is discussed in terms of habitat, structure, nutrition and life cycle. In this way the syllabus stresses inter-relationships between groups of plants and their environment.

The work of Standard 9 continues in Standard 10 with the emphasis on animals. Once more habitat, structure, nutrition and life cycle are stressed. There is also an introduction to taxonomy and a separate section entitled "The Web of Life" which emphasises inter-relationships within the ecosystem. Within this section there is a section on man's activities in natural systems, which emphasis on pollution, nature conservation and protection of indigenous flora and fauna.

The Senior Secondary syllabuses do not directly deal with climatology or geomorphology. Oblique references are made to these in the section on Ecology where abiotic components of the ecosystem are listed (temperature,

light, water, edaphic and physiographic factors), but from this it is inferred that the pupils are studying the affects of these factors on the ecosystem, without necessarily knowing or understanding the factors themselves. Tinley (1977:58-78) has pointed out that the two most important sets of processes controlling the growth and development of life in an ecosystem are climatic processes and edaphic or substrate processes, and it therefore follows that an appreciation and basic understanding of these processes is necessary in order to understand the ecosystem itself. This appreciation and understanding is important in problem solving situations since changes in either climate or landscape (particularly at micro- or meso-scales) may occur relatively rapidly, frequently as a result of man's mismanagement of the land.

In suggesting that relevant aspects of climatology and geomorphology be introduced into the Biology syllabuses it is not suggested that in-depth studies be made. What is being suggested is that research be undertaken to ascertain what information is required by the pupils in Standards 8, 9 and 10 to enable them to obtain a clear picture of all the ecosystem controls.

An aspect of the Senior Secondary course that requires attention is that of map and/or photograph interpretation. The syllabuses do not mention the use of maps or photographs to show the distribution of phenomena being studied. Map drawing and the use of maps to show distribution is important for two reasons. Firstly in learning to draw maps showing biological data the pupil is being trained in a basic natural science skill. (This is in agreement with the principal of totality discussed by Duminy (1980:22), Engelbrecht and Lubbe (1980:14) and others, in which the "total" faculties of a person are developed.) Secondly in drawing and/or

using maps pupils learn to locate the phenomena they are studying in space (something which is badly neglected in Biology syllabuses) and develop a "feel" for the spatial distribution of the phenomena they study. Since the relative positions of phenomena within an ecosystem affect the nature of relationships within that system, this insight is necessary for a more complete understanding and appreciation of the ecosystem.

The syllabus also omits to mention the use of photographs for studying the distribution of biological phenomena (or for any other purpose). Both oblique and vertical air photographs are valuable tools in studying habitats, communities and ecosystems. With improvements in space-age technology images of the earth, such as those obtained by the Earth Resources Technology Satellite (ERTS) are becoming more freely available to teachers. The ERTS images are particularly interesting since they reveal changes in habitat far more quickly than more conventional methods, and may be used with great success in discussing environmental problems and their solutions.

It should be noted that the Geography syllabuses for Standards 6 to 10 all cater for mapwork of various kinds, and in the Senior Secondary phase oblique and vertical air photograph interpretation is included. Thus all pupils up to Standard 7 should be well acquainted with the drawing and interpretation of maps. The figures in Table 2 suggest that a large number of pupils drop Geography after standard 7, and it is thus only a small number of Biology pupils (approximately 20% in the matriculation year of 1979) who continue with map and photograph analysis in the Senior Secondary phase. In addition those Biology pupils who do not take Geography in the Senior Secondary phase (Table 2

suggests the percentage could be as high as 60) do not receive any instruction in the use of photographs as interpretive tools. Finally, since none of the Biology syllabuses cater for map or photograph interpretation, those pupils who do take both subjects will not receive training in the application of maps and photographs in the biological field. For these reasons it is important that the Biology syllabuses be improved by adding some work in this connection.

3.4.4 Geography syllabuses and Conservation Education

As in the case of Biology syllabuses the Geography syllabuses contain a wide range of topics which provide pupils with information on certain aspects of the environment.

In Standards 6 and 7 the emphasis is on mapwork, climatology, geomorphology and regional studies. Through doing mapwork the pupils should learn more about spatial distribution - something which is essential if inter-relationships are to be properly appreciated, while through studies of climate and geomorphology the pupil can gain insights into the abiotic elements of the environment. Regional geography emphasises inter-relationships, linking the physical environment and its exploitable resources, with economic activities. In dealing with major natural regions of the world there is an opportunity for the pupil to learn about ecology and human environments other than his own. Properly correlated with Biology the contents of the Geography syllabus in Junior Secondary school phase could help to develop an holisitc approach to environmental studies.

In Standards 8, 9 and 10 the pupils continue with mapwork studies, and photograph analysis is also included.

There are also sections on climatology and geomorphology. Human geography concentrates on population studies with emphasis on over-population, resource management and other topics related to Conservation Education. In respect of over population and resource management it has already been mentioned (in the discussion on aims) that the syllabus emphasises problems rather than solutions, but nevertheless it does give the pupils an opportunity to examine man's role in the environment and this should stimulate the development of positive attitudes.

The Senior Secondary syllabus tends to be systematic in approach and there is little opportunity for linking climatology and/or geomorphology with biotic elements in the environment. This is a pity because the sections on climate and geomorphology are well structured and should lead to a good understanding of the physical environment (the base on which the biotic elements rest) particularly at a micro- and meso-level (for example, valley climates and the katabatic flow of air in the climatology section and fluvial processes leading to variations in landscape and soil formation in the section on geomorphology). It is suggested that consideration be given to the inclusion of discussion on the effects of climate and/or topography on the biotic components of the ecosystem. This type of discussion does not have to be lengthy or go into any depth. It should be just sufficient to ensure that the topic is seen holistically.

3.4.5 The Geography and Biology syllabuses - an overview

In general it appears that in the Junior Secondary phase the syllabuses for both subjects have been more holistically planned. It is also a fact that both Geography and Biology (as part of General Science) are

compulsory subjects during this phase. Through studying both subjects the pupils should obtain a wide range of information and skills which are of direct value to Conservation Education. Nevertheless more correlation between Biology and Geography at this level is still essential both in common-ground topics, and in particular, in cross-referencing. (What has been said here may well apply in the case of Biology and General Science, or in the case of Mathematics and Science. In fact one sees the need for a greater correlation between a number of different school subjects, not only in the field of Environmental Education, but also with regard to holistic education in general.)

Table 3 shows that relatively few pupils take Geography compared to those taking Biology in the Senior Secondary phase. Less than 20% of the pupils (in 1979) took both subjects. The significance of this is that there is relatively little opportunity for Biology and Geography teachers to combine together in a common environmental programme. This means that each of the subjects should contain sufficient numbers of basic environmental elements to enable pupils taking only one of the subjects to obtain an holisitc picture of the environments they study. In the case of Biology there is a need for more information on processes affecting the abiotic elements in the environments they study, while in Geography there appears to be an equal lack of information on biotic elements.

A working knowledge of map and photograph analysis helps the pupil gain an overview of the material being studied. It also assists with the development of concepts of inter-relationships. In this connection there is a need for a course of map and photograph analysis, or at least some contact and experience with image material of some sort, in the Senior Secondary

syllabuses for Biology.

3.5 CHAPTER SUMMARY

In this chapter an attempt has been made to assess the potential of Biology and Geography at school level with regard to Environmental Education.

In general all the Secondary School syllabuses for Biology and Geography contain a number of aims linked to Environmental Education. However, there was a noticeable lack of aims stated in behavioural terms. It is not enough to have aims or objectives linked to the development of knowledge and attitudes. It is essential that the pupils' future behaviour be affected by the particular programme he is taking part in.

A number of topics in both Geography and Biology have the potential to improve Environmental Education in the pupils taking the subject. The Junior Secondary syllabuses are well integrated within themselves, although there is a complete lack of integration between subjects. The fact that Biology and Geography are compulsory subjects in the Junior Secondary phase means that the potential for Environmental Education is good. In the Senior Secondary phase, where many more pupils take Biology than Geography, there is a lack of material in both subject syllabuses. Biology pupils lack information on many of the physical aspects of the environment, and Geography pupils lack information on the biotic elements. In addition Biology pupils do no map or photograph interpretation and thus are hampered in their interpretation of spatial distribution of the phenomena they study. A final, yet major area of criticism, is the fact that there is

no correlation between the syllabuses. Statistics suggest that approximately 20% of the pupils taking Geography and/or Biology take both subjects, and there should be contact between the Geography and the Biology teachers to deal with areas of overlap and complementarity.

Finally it should be stated that both syllabuses have the potential to make substantial contributions to the creation of Environmental Awareness. The realisation of this potential will depend mainly on teaching methods - an aspect of this investigation which is discussed in Chapter 4.

CHAPTER FOUR

THE PRACTICE OF TEACHING

4.1 INTRODUCTION

No matter what a syllabus contains or what its expressed aims and objectives are, it is the teacher, in the final analysis, who is responsible for its successes or failures. It is at the "chalk face" that young people encounter, often for the first time, information and instructions on widely ranging topics. In the case of Environmental Education it is the teacher's knowledge of and insight into, the subject which will affect the way in which material is presented.

In this chapter an attempt has been made to define good teaching in the widest sense before good environmental teaching is discussed. Thereafter the potential of teachers in Transvaal Secondary schools for Environmental Education is discussed in the light of the training they receive (both in-training and in-service) and in the light of available resources.

Attention is focussed on training teachers for fieldwork activities as well as holistic teaching. In connection with resources, fieldwork venues, audio-visual material and printed material receive the most attention.

The final area of discussion is the availability of relevant resource materials from both government as well as non-government sources.

4.2 THE DIDACTIC SITUATION

The science of teaching is known as didactics. It is a science involved with the meaning of the concept of education, the meaning of the concept of learning, the subject matter being taught, the development of good teaching-learning situations and the development of sound techniques for acquiring knowledge. Engelbrecht and Lubbe (1978:3-4) distinguish between general didactics, which is involved with the more general aspects of the didactic situation (such as those just mentioned), and subject didactics, which is to do with the teaching of a specific subject or group of subjects. In this study Environmental Education is discussed in terms of subject didactics.

According to Bone (1978:4) until fairly recently teaching was viewed largely as a didactic process in which the teacher, who was master of a certain field of knowledge, instructs the pupil in this field. Reaction against this view led to emphasis on people learning for themselves with teachers arranging the conditions for learning to take place. The teacher neither dominates the situation nor moves into the background. There is a continuing and varying interaction between teacher and learner that places the two together in the didactic situation. This relationship has implications for the didactic situation since it places greater emphasis on pupil orientated materials (such as books and other aids) and has resulted in changes in teaching methodologies.

Engelbrecht and Lubbe (1978:5-6) list three components of the didactic situation. These are the child, the guiding teacher and the subject matter to be learned. Yule (1979:2) agrees with Engelbrecht in this regard. He depicts the didactic situation as a triangle with

the three elements making up the corners of the triangle. He points out that the relationship which exists between teacher, learner and material is not unidirectional, but that there is reciprocity of influence between them. It is suggested that the learning environment may be seen as a fourth basic component to the didactic situation. In this situation the learning environment refers to factors outside the direct control of either the teacher or the learner and concerns factors such as the neighbourhood of the school, air and noise pollution, the physical condition of school buildings, the availability of manufactured teaching aids and other similar items. The learning environment will have a greater effect on the teacher, the learner and the subject matter being taught, than these three items may have on it. This is an important point for consideration in connection with Environmental Education.

4.3 THE DIDACTICS OF ENVIRONMENTAL EDUCATION

4.3.1 What is good teaching?

Engelbrecht and Lubbe (1978:12) describe teaching as a situation in which "the teacher, by means of planned and purposeful actions and with certain teaching aids at his disposal, helps and guides the pupil towards the realisation of a definite pre-determined goal." The attainment of that goal would be the measure of the effectiveness of the teaching.

Bone (1978:5-6) is of the opinion that good teaching involves "decisions about objectives; careful planning of the learning situation, the nature of the learning experience, the extent and nature of the teacher's participation in the experience and the means of

assessing what learning has taken place; the establishment of good relations with the learner; the execution of the plans (with the effective use of techniques) and finally personal skills, knowledge and attitudes."

Seymour (1978:6) describes good (primary school) teaching as a "synthesis of understanding and compassionate partnership in which children and teacher together explore the physical, intellectual, social, spiritual, moral and aesthetic experiences that go to make up the exciting and expanding world of the primary school child."

Leonard et al. (1972:5) discuss interaction between teaching and learning as the key to effective teaching. According to him there are basically five variables in this interaction. These are :

The Who variables (the teacher and the pupils)
The Why variables (the purpose of the lesson)
The What variables (the subject matter or contents)
The When and Where variables (the learning environment)
The How variables (the procedures and techniques).

Van der Stoep and van der Stoep (1973:90-107), Duminy and Söhnge (1980:21-58) and Engelbrecht and Lubbe (1978:12-21) all discuss the fundamental principles of education implicit in all "good"teaching situations. These include :

(i) the principle of totality which holds that man's many characteristics make up a "whole" or a "totality" and that in teaching a young person he or she must be seen in this

light. There must be no artificial separation of intellect and spirit.

(ii) the principle of individuality which stresses the fact that no two people are alike and that the needs of each individual must be recognised;

(iii) the principle of socialisation which stresses the fact that children are social beings;

(iv) the principle of development which recognises the fact that man develops gradually along the path of life through various developmental stages. The teacher in his choice of subject matter and teaching methods must always consider the stage of development of his pupils.

(v) the principle of activity and self-activity. Here the emphasis is on goal orientated learning activities. The child must be guided to self-activities which coincide with the aim of teaching. Engelbrecht (1978:16) says that "education is only successful if there is activity on the part of the pupil. Knowledge that has been gained personally and by own experience is not easily forgotten."

(vi) The principle of motivation and interest. This is regarded as one of the most important didactic principles. In a good teaching-learning situation the learner (and the teacher) must be properly motivated if the goals of that situation are to be achieved. Duminy and Söhnge (1980) point out that variety in both materials and techniques are both essential aspects of learner motivation. By creating the right leaning environment the

teacher is doing much to contribute to the achievement of lesson goals.

(vii) the principle of observation and perception. This is based on the fact that knowledge is based on concrete experience and observation. Duminy and Söhnge (1980:40) point out that perception and thought belong together inseparably, and that the only effective way by which the child is introduced to his environment is through perception and direct experience. With the growth in complexity of the environment, and the extension of learning to distant places, it has become necessary to introduce audio-visual aids to supplement direct experience. By using audio-visual aids it is possible to introduce the child to knowledge that lies beyond his personal experience. This aspect of education is of particular importance and relevance to Environmental Education since the field of study involves interactions in places geographically distant from each other.

Duminy and Söhnge (1980:44) point out the dangers of "over-using" audio-visual aids. They point out that excessive perception retards thought. Observational material must be used discriminately and the part of language must not be lost sight of in the endeavour to move towards abstract thinking. In this connection the principle of selection is most relevant. Through careful selection of audio-visual aids the teacher ensures the best learning situation, while at the same time ensuring the best coverage of the subject.

(viii) the principle of selection which was first formulated in connection with the teaching of physics. Subjects with detailed and complex contents are taught through the judicious selection of examples. The child learns about the structures and processes of a complex subject in this way. As Duminy and Söhnge (1980:57-58) put it: "From the particularity of the example the child is led to the generality of the whole." He is taught, through selected examples, to organise his thinking about the large amount of knowledge. The principle is also important in Environmental Education where a vast fund of information is available on a multitude of facets.

(ix) the principle of environmental teaching which refers to the view that children should learn through observation and perception of the local environment. This is important for two reasons. Firstly the child is already familiar with many aspects of the environment and the teacher can build on this knowledge, and secondly, by helping the child to a more conscious experience of the environment, the teacher (and therefore the school) is becoming more functional in the life of the child.

In studying aspects of the environment of the child, the teacher must apply the principles of selection and must guard against "over-use" of examples which might inhibit learning rather than stimulate it.

(x) the principle of moving from the known to the unknown. Children should begin with something they know and build on this knowledge to learn something new. This is of significance to Environmental Education where knowledge of the local environment can be used to build up knowledge of other environments.

(xi) the principle of moving from the simple to the complex which is similar to the previous principle. This is also related to the principle of selection. The teacher needs to build up the child's knowledge through the use of judiciously chosen examples.

(xii) the principle of learning from the parts of the whole and back to the whole. This principle is related to holistic teaching. the child must learn to study the parts of an environmental feature (for example an ecosystem, a tree, soil) as well as the feature as a whole.

4.3.2 What is good environmental teaching?

Good teaching in general has already been discussed. The main elements of good teaching are planned actions and the achievement of goals. This discussion applies equally well to Environmental Education. The "planned actions" include the judicious use of teaching aids, the use of the local environment in relevant situations, an holistic approach to environmental studies, the encouragement of self activity and the encouragement of observation and perception and activities aimed at developing the "whole" child.

The goals of Environmental Education have already been discussed. These were summarised as the development of environmental literacy, the development of environmental competency and the development of environmental dedication. The objectives of lessons or groups of lessons will be linked to these long term goals. Good environmental teaching is therefore teaching which, by its planned action, achieves these goals.

4.3.3 Problems related to good environmental teaching

A report by the Wildlife Society of Southern Africa revealed a number of "problem" areas in the teaching of environmental subjects such as Biology and Geography (Hurry 1978:23-24). The problems were divided into three general categories. The first was to teacher expertise in fieldwork and/or practical work, the second was an apparent lack of integration of relevant material (i.e. a lack of an holistic approach) and the third was the provision and/or availability of suitable resource materials, especially those linked to Conservation Education.

With regard to teacher expertise and fieldwork, the Wildlife Society report highlighted two areas of concern. The first was that teachers made little use of the local environment (especially the school grounds) for fieldwork activities, and the second was that many teachers lacked the knowledge and/or experience to conduct practical work or fieldwork. The report also highlighted the fact that not one school could be found in South Africa which had developed part of the school grounds for environmental studies (e.g. indigenous plant collections, ponds built for studies of aquatic life and micro-slopes created for micro-ecological studies).

(Note : This was not to say that schools did

not use their grounds for outdoor education of some sort or another, but rather that there appeared to be no school with a planned site or sites where this could take place.)

This study reappraises the findings of the Wildlife Society. Teacher training, (both in-training as well as in-service) is examined with particular reference to training for fieldwork and to subject integration, as is the question of supply and availability of resource materials (for both the teacher and the pupil).

As part of the reappraisal of the Wildlife Society's findings, a questionnaire was sent to the Heads of the Departments of Biology and Geography Didactics at each of the nine teacher training institutions. (A copy of the questionnaire is contained in the Appendix.) The answers to the questionnaires, together with subsequent telephone conversations and personal interviews, form the basis of the comments that follow.

4.4 TEACHER TRAINING IN RELATION TO FIELDWORK MANAGEMENT AND TO SUBJECT INTEGRATION

4.4.1 Colleges of Education and Universities

4.4.1.1 Introduction

The five Colleges of Education fall directly under the control of the Transvaal Education Department. The four Universities are autonomous bodies that receive financial assistance from the state. The Colleges of Education work closely with the Universities, especially in the drawing up of (academic) subject syllabuses, and in the moderation of examinations.

Colleges of Education train teachers for Primary School education, although a number of students may teach up to Standard 8 in certain circumstances. The universities teach teachers for both Junior Secondary and Senior Secondary work, although the general emphasis would seem to be on the latter.

Both the Colleges and the Universities tend to separate "academic" courses from subject didactics. Both Geography and Biology are taken as separate subjects (at University Biology is divided further into Zoology and Botany) and subject didactics is taught entirely separately. At the Colleges subject didactics is taught concurrently with the academic courses, while at the Universities it is generally taught at post-graduate level.

4.4.1.2 Training for Fieldwork

All Colleges of Education and Universities see fieldwork as an important part of a Biology or Geography teacher's training. Not all institutions, however, give the same amount of attention to it.

Certain Colleges have practical problems which make fieldwork difficult. The large numbers of students at Goudstad Teachers' College for example present a problem in both Biology and Geography teacher training (Jordaan and Boyse, 1980:pers.comm.). Most of the practical work is done indoors as a result. At Pretoria Teachers' College (Afrikaans) a similar problem in the Biology section limits the amount of fieldwork the students can do (Wessels, 1980:pers, comm.). Fieldwork methodology is handled as part of the students' own fieldwork activities. According to du Plessis (1980: pers.comm.) no instruction is given to the student

teachers of Geography at the Potchefstroom College of Education in planning and management of practical work (including fieldwork).

Students at the Pretoria College of Education (English) are required to compile fieldwork activities and to test these under controlled conditions (Fairhurst, 1980:pers.comm.). The Johannesburg College of Education has pioneered a credit course in fieldwork management. The course, which is offered by the Department of Geography, involves training in the drawing up of sound educational aims and objectives, training in administration related to fieldwork activities (ranging from bus bookings to planning the itinerary), and training in the execution of the fieldwork itself. An interesting and important aspect of the course is the section on follow-up techniques (Rogers, 1980: pers. comm.).

Most Universities provide training in fieldwork methodology. Biology and Geography student teachers at the University of the Witwatersrand, for example, are expected to draw up their own fieldwork exercises and to put them into practice (Kidson, 1980: pers. comm., Earle, 1980: pers. comm.). The Geography methodologist at the same University has produced a teacher's guide to fieldwork studies which contains comprehensive notes on the organisation and execution of fieldwork activities ranging from short programmes to programmes involving a number of days (Beckedahl, et al, 1979).. Two University departments of subject didactics which do not have specific training programmes for fieldwork methodology are the Biology Department at the Randse Afrikaanse Universiteit and the Geography Department at the University of Pretoria. However, both Departments do have courses of (indoor) practical work (Nieboer, 1980:pers. comm.).

Since it has already been established that environmental teaching fulfills a basic didactic principle, it is unfortunate that several training institutions are not able to conduct meaningful fieldwork programmes. Fieldwork is an essential element of environmental teaching and teachers who are not themselves experienced in fieldwork will have greater difficulty in running their own fieldwork projects than teachers who have. It frequently happens that a lack of knowledge leads to uncertainty, and in these cases teachers with little or no fieldwork experience will be less inclined to organise and run their own fieldwork projects than those who have.

4.4.1.3 Subject integration

The question of subject integration in secondary schools is discussed in section 2.5.4. In this section two important points are stressed. The first is that subject integration does not involve a loss of "identity" of the subject concerned. (The reverse is true since intelligent use of integration will benefit rather than detract from each subject.) It calls for an intelligent use of material from different subjects (such as Biology or Geography) in the interests of an holistic approach to the Environment. The second point is that integration of material from different subjects could and should be used in problem-solving situations. This is particularly relevant with regard to Environmental Education.

In the field of teacher training the student teacher should be taught not only to think holistically, but also to teach holistically. If this is to be achieved it follows that the lecturers must think and teach holistically. Evidence from answers received from the questionnaire suggests that there is considerable room

for improvement in this regard. Of the grand total of 18 departments contacted (i.e. Biology and Geography departments of 9 institutions) there were only four examples of inter-departmental co-operation on common-ground topics or fieldwork, and of these four only one appeared to be comprehensive (that of the Randse Afrikaanse Universiteit. The details are as follows :

1. The Geography methodologist at the University of the Witwatersrand sends copies of fieldwork activities to the Biology methodologist.

2. At the same university Biology and Geography students with B.Sc. degrees attend a "General Science" methodology course run jointly by lecturers from both sciences. (The topic of excursion management and/or fieldwork management is covered in this course.)

3. The Biology and Geography departments at the Johannesburg College of Education combine in an annual fieldwork activity involving final year students.

4. All post-graduate student teachers at the Randse Afrikaanse Universiteit attend courses in Teaching Science) (Onderwyskunde) which are run by lecturers from both subjects.

Further comment on the Teaching Science course offered by the Randse Afrikaanse Universiteit is necessary. As far as can be ascertained it is the only course of its nature in the country. It has been described by the senior methodologist for Biology (Müller 1980:pers.comm.) as "a linking course between general didactics and subject didactict." Its main aim is to reveal to the student the way in which school subjects work together

to educate the child. It includes methodology on audio-visual aids, practical work and field work. It would appear to be a good example of adherence to the didactic principle of totality (discussed in detail in section 2.3.2 of this study) and has the potential to make a substantial contribution to holistic teaching.

Continuing on the theme of subject integration it is a fact that a number of lecturers from the teachers' colleges, particularly the heads of department, serve on subject committees, such as the Biology and Geography study committees. The apparent lack of communication between Geography and Biology lecturers at colleges of eucation (with the exceptions mentioned previously) could have adverse affects on the development of the subjects in the schools. It is therefore doubly important that lecturers in the colleges meet to discuss the future of environmental studies firstly in the colleges themselves (which are after all the main source of supply of primary school teachers and a major source of supply of secondary school teachers) and secondly in the schools in which their teachers are to perform their work. It is only through this sort of contact that both Geography and Biology will blossom as individual subjects, and that as a result of this an improvement in Environmental Education can be achieved.

The lack of co-ordination between Geography and Biology reflects a dichotomy in the educational system. On the one hand student teachers are trained to base their lessons on sound educational principles, while on the other they are generally not shown how to do so. For example, the didactic principle of learning from the parts of the whole, to the whole and back to the parts, is an expression of recognition for holistic education. The fact that the lecturers of environmental subjects

such as Biology and Geography seldom if ever meet to discuss common ground topics, and the fact that student teachers pursue individual subjects in much the same way as they did at school, is not conducive to good holistic Environmental Education. Student teachers are denied guidance in the integration of material from the different subjects, and as a result have their perception of the total environment blunted. If teacher training institutions are to emphasise sound didactic principles as the basis of good teaching, then the institutions themselves should provide the best possible models of the application of these principles. In the case of training for effective Environmental Education it is apparent that a number of colleges and universities need to re-appraise their training programmes, particularly with regard to inter-subject co-operation and action.

4.4.2 In-service teacher training

4.4.2.1 In-Service centres

There are two in-service centres in the Transvaal. One, the College of Education for Further Training, is run by the Transvaal Education Department, and the other, the Teachers' Centre, is run by the Transvaal Teachers' Association.

The College of Education for Further Training (in Pretoria) offers a wide range of courses aimed at improving teachers' qualifications. Science, Mathematics, Biology (Botany and Zoology), the Humanities (including Geography) and Commerce are the courses offered on a full-time basis, while Youth Preparedness is offered as a part-time course. The following are details of courses offered by the

College :

A : Full-time courses

(i) The Further Diploma in Education (F.D.E.). This course is for students with matriculation exemption. Courses are taken in conjunction with UNISA.

(ii) Higher Education Diploma (Technical) (H.E.D (Technical)). This course is for teachers with technical qualifications who wish to obtain teaching qualifications.

B : Part-time courses

(iii) Further Diploma in Education (F.D.E.). There are at present four different correspondence courses. These are : Minimal Brain Dysfunction, Special Education, Youth Preparedness and School Subjects.

Teachers who take any of these courses must have a minimum of a 3 year diploma as well as matriculation exemption. Teachers who enter the programme must take at least 2 years' study per course and do practical work during one or more of the school holidays. Teachers who complete courses have these endorsed on the certificates.

(iv) Diploma in Education (D.E.). This course is intended for teachers with 2 year diplomas who wish to convert to 3 year diplomas. The minimum duration of the course is two years. A minimum of 5 academic subjects must be taken. These include Pedagogics and combinations

of subjects suitable for school teaching such as Geography, Zoology and History.

(v) Higher Diploma in Education (H.D.E.). This course is intended for teachers who have the T.E.D. or recognised equivalent 3 year diploma in primary school education. The course must include at least 9 academic subjects. These include Pedagogics and combinations of teaching subjects such as in the H.E.D. course.

(vi) Single subjects may be taken in accordance with T.E.D. requirements for promotion posts. They may not be used for category classification.

Within the courses for Biology and Humanities there is a section on subject didactics. Teachers of these two subjects can therefore receive up to date advice on the latest teaching methods while they are improving their subject knowledge. Table 6 shows the numbers of teachers from the Transvaal who were enrolled in full-time or part-time courses at this College. From this table it may be deduced that a relatively high percentage of teachers is enrolled annually for either part-time or full-time courses (40% in the case of Geography, and 28% in the case of Biology).

The Teachers' Centre in Johannesburg is a small centre run by the Transvaal Teachers' Association. It has a General Secretary and an educational organiser. One of the functions of the Centre is to organise in-service courses for teachers. These courses, which may range in duration from an afternoon to a few days are run by serving teachers, or lecturers from colleges or universities, in collaboration with the Centre. Of the

TABLE 6 : TEACHERS FROM THE TRANSVAAL EDUCATION DEPARTMENT WHO ENROLLED FOR BOTANY, ZOOLOGY (i.e. BIOLOGY) AND GEOGRAPHY COURSES AT THE COLLEGE FOR FURTHER TRAINING - 1978 AND 1979 (Source : T.E.D.)

SUBJECT	NUMBER OF STUDENTS			
	FULL-TIME		PART-TIME	
	1978	1979	1978	1979
Botany I	23	12	49	67
Botany II	14	15	8	9
Zoology I	22	12	60	70
Zoology II	14	16	10	10
Total Biology	73	55	127	156
Geography I	52	58	138	132
Geography II	31	34	13	18
Total Geography	83	92	151	150
Grand Total	156	147	278	306

Estimated number of teachers in secondary schools (1980)+

	Geography	Biology
Junior Secondary phase	190	231
Senior Secondary phase	409	525
Total	599	756

+ Source: Connacher (pers.comm.) and Van Dyk (pers. comm.)

50 courses arranged by the Centre in 1979 three were for Biology teachers. There were none for Geography teachers. The Teachers' Centre also assists in the production of notes and other resource material (see section 4.5).

4.4.2.2 Other organisations or institutions

In-service courses are occasionally offered or arranged by various organisations or institutions. Universities, teachers' colleges and subject associations are involved.

In 1974 the subject inspectorate organised orientation courses for both Biology and Geography teachers. These were aimed at familiarising teachers with the new syllabuses of that time. Subsequent courses have been arranged on a regional basis. (The province is divided into 6 administrative regions.) In the case of Geography the last regional courses were arranged in 1974, while for Biology there have been regional courses each year for the past 3 years.

A possible reason for the relative frequency of Biology courses as opposed to Geography courses is that the Biology syllabuses call for a large amount of practical work, most of which is done in the laboratory. Much of the in-service work has been orientated towards laboratory techniques and ways of conducting practical work. It is possible that Biology teachers have felt the need for further training in this aspect of their teaching. The Geography syllabuses, on the other hand, do not contain as much practical work, and although fieldwork is an integral part of the syllabuses, it may be that teachers have not yet expressed the need for further training in this connection.

There are only two associations for the teaching of Biology and Geography that are presently involved in in-service work of any kind. The Geography Teachers' Association collaborates with the Johannesburg College of Education and the University of the Witwatersrand to organise and run occasional courses for in-service teachers. (There is usually one per year.) The Biology Study Committee of the Transvaal Teachers' Association collaborates with the same institutions to organise similar courses for Biology teachers.

Some Biology and/or Geography departments at Transvaal Universities run in-service courses, sometimes in collaboration with local teachers' colleges and sometimes with other organisations. Examples of this kind of course were the Biology and Geography courses organised by the Centre for Continuing Education (attached to the University of the Witwatersrand and the only one of its kind in the Transvaal) in 1980; the one day course of evaluation organised by the Association of Education Evaluators in South Africa in collaboration with the Johannesburg College of Education and the University of the Witwatersrand for both Biology and Geography teachers (which included discussion on fieldwork evaluation) in 1980; and a four day Biology methodology course organised and run jointly by the Johannesburg College of Education and the Biology methodologists at the University of the Witwatersrand.

In addition to the courses already mentioned the colleges of education run extra-mural courses aimed at improving the academic knowledge of teachers. Although these are content orientated, they do provide an opportunity (should it be taken) of improving teachers' knowledge of Environmental Education.

4.4.2.3 The need for functional in-service training centres

There appear to be a reasonable number of in-service training courses for Biology and Geography although the latter appear not to be as numerous as the former. A closer look at the facts reveals that most, if not all, of the in-service courses offered took place in the major centres of Johannesburg and Pretoria. In addition not all Biology or Geography teachers from these centres were able to attend in-service courses.

The College of Education for Further Training does not have facilities for assisting teachers with day to day problems experienced in subject didactics. The Centre run by the Transvaal Teachers' Association has only administrative staff and so it too is not equipped to handle problems of this nature. There is a need for a well equipped centre with a staff of subject experts which could serve the everyday needs of teachers. In addition to offering advice, such a centre could also develop resource material on a continuous basis and act as a distribution point for such material. The Department of Education in the Cape has two such centres (one in Cape Town and the other in East London) which serve the needs of a large number of teachers in the surrounding area. In addition to producing resource materials the Cape centre also encourages teachers with proven material to make it available to their colleagues, and reproduce such material for distribution.

In-service training courses for both Biology and Geography cater for certain aspects of the syllabus. Areas of concern are identified by the teachers and these usually form the basis of a course. As far as could be ascertained there were no courses for either Biology or Geography during the past 3 years which catered

specifically for Environmental Education or for holistic teaching with regard to the environmental sciences. In the first place there is a need for in-service courses to concentrate on aspects of Environmental Education (in particular on methods which could be used to integrate information and approach the subject holistically), and in the second there is a real need for a permanent teachers' centre (such as the one mooted above) which would concentrate on the improvement of Environmental Education in general and Conservation Education in particular. Such a centre would contribute to the knowledge of young people of their environment, and so make a contribution to environmental conditions across the board.

It is of relevance to this discussion to consider the plight of the rural teachers concerning in-service training facilities. At present nearly all the in-service work takes place in the larger centres such as Pretoria and Johannesburg. If a teachers' centre of the kind suggested in the previous paragraph were to be established the likelihood is that it would be established in either Pretoria or Johannesburg. The rural teacher has problems reaching in-service courses at present held in the cities and would have little or no contact with an on-going teachers' centre should it be established. In this respect it is suggested that the "cell" method of instruction, presently in use in Indian education, be considered for adaptation for Transvaal conditions. The Department for Indian education uses qualified Geography teachers in high schools to act as leaders of small groups or cells of primary school teachers (Singh 1980:pers. Comm.). Each responsible high school teacher has his or her own geographic area to look after. He or she has regular contact with the primary school teachers and assists them with problems related to Geography didactics.

In the case of Biology and/or Geography teaching this idea could be adapted to the Secondary school situation, whereby a good subject teacher could take others in the district under his or her wing. Through discussion of problem areas common to most, such a group could benefit greatly from such a situation. In particular fieldwork and/or practical work could be improved which would be of great value to Environmental Education.

Henning (1979) writing on Environmental Education in the Transvaal agrees that teacher training is the key to successful Environmental Education programmes. He sees the greatest responsibility for improving teacher motivation and expertise in this field resting with the teachers' colleges and universities. He also emphasises in-service training courses. He concludes his comments on Environmental Education by stating : "The facts remain that until all teachers are fully committed to Environmental Education, and all that this implies, it cannot be claimed that all pupils are receiving an adequate course in Environmental Education" (op.cit.:66).

4.4.3 Summing up : Teacher training with regard to training for fieldwork management and subject integration

From replies received from the Colleges of Education and the Universities, it would appear as if all lecturers are agreed that training in the management of fieldwork activities is important for student teachers. However, not all institutions are involved with the practical implementation of this ideal. In certain instances practical difficulties place restrictions on fieldwork management training. In other instances this type of training is not part of the curriculum. At the other end of the scale certain institutions have well structured

programmes of training in fieldwork management. One of the probelms of fieldwork activities is that there is only one handbook on fieldwork management (produced by the University of the Witwatersrand). This factor alone limits the efficacy of fieldwork management training programmes.

Subject integration or co-operation at the various institutions appears to be minimal and there is considerable room for improvement in this regard. It will not be possible for teachers to think or teach holistically if there is no example set at the colleges or universities. This aspect of all teacher training requires the most urgent reform.

On the question of in-service courses it would appear that these are sporadically organised and not orientated to Environmental Education. There is a real need for on-going in-service programmes for both Biology and Geography, and in this respect permanent in-service centres and/or permanent in-service staff are suggested.

4.5 RESOURCE MATERIALS

Resource materials include notes, activities such as games and puzzles, books and magazines and audio-visual aids in general. There are basically two groups of materials, namely those that are of most use to the teacher and those which are of most use to the learner. Since the didactic situation involves an interaction between learning and teaching both groups of materials are equally important.

Teacher Material is basically of two types, namely reference material and teaching material. Reference material is resource material which the teacher uses to increase his/her knowledge of the subject, whereas teaching material is material which the teacher may use

in conducting a lesson. There are also two main types of pupil material. The one is material which the pupil looks at or uses with guidance from the teacher, and the other is material which is used by the pupils themselves and which is usually of a "self-guiding" nature.

There are a number of sources of supply of resource materials. These are : The Transvaal Education Department, the Department of National Education, various in-service training centres, universities and colleges of education, teaching societies, newspapers, the Department of Nature Conservation, other non-profit seeking organisations and commercially motivated companies.

4.5.1 The Transvaal Education Department

4.5.1.1 Teaching guides

The T.E.D. produces limited resource materials for teachers. The Junior Secondary syllabuses contain notes on the teaching of various topics in both Geography and Biology (in addition to the aims and objectives given at the beginning of each syllabus), while the Senior Secondary syllabuses contain only the aims and objectives (in both subjects).

In addition to the syllabus booklets the T.E.D. (through its subject committees) produces guides for certain classes or topics in both Biology and Geography. In the case of Biology the guides are mainly for the teachers. The material contained in the guides relates mainly to problem areas such as cell biology, but Study Guide No.6 discusses in detail the "Investigatory Approach" to Biology which includes discussion on goals in the cognitive and affective domains. Pollution is discussed as an example and levels of objectives are

listed. The top of the hierarchy of levels, that of the value-complex, is discussed and mention is made of the fact that, in matters such as pollution, the value-complex should become part of the pupil's philosophy of life.

In the case of Geography the study guides are mainly schemes of work, although there are two guides on map-work and one on general methods for Standard 5 Geography. The schemes of work include notes (for both pupils and teachers) on one or two difficult topics (for example synoptic map interpretation) and bibliographies of recommended books. (It is worth noting that there is only one reference which is related directly to Environmental Education. This is a book on pollution listed in the booklet on the Standard 7 syllabus.)

The T.E.D. guides for Biology and Geography are neither numerous nor frequent. There are only 7 guides for Biology (all of which were produced in 1969) and a similar number for Geography (produced in 1973).

4.5.1.2 Audio-visual aids

The Transvaal Education Department runs an audio-visual aid service with its head quarters in Pretoria. The service operates at two levels. Firstly it reviews books, periodicals, other printed media, wall charts and similar display items, 35 mm slides and filmstrips and gramophone records. Those that it considers suitable for schools it lists in a periodical, known as "Media Guide" which appears from time to time. Materials that are listed in this guide may be allocated to the school (when applied for) by the T.E.D. Secondly the Department keeps a supply of filmstrips, tapes and pictures which it loans to teachers.

The 1979 Media Guides (3 in all) list a number of books which could be used for Environmental Education. These include wildlife encyclopaedias, general ecology books and books on pollution. Although there are a number of filmstrips listed which are suitable for Geography and/or Biology there is none which deals specifically with Environmental Education.

In the filmstrip lending library there are a number of items which are suitable for Environmental Education. Of the 40 Geography filmstrips items such as "People and Resources", "Tokyo - living in cities" and "The urban impact" are most relevant. Of the 84 filmstrips for Biology filmstrips such as "What is ecology?", "Animals and their world" and "An example of an ecosystem" treat environmental studies in an holistic manner. At this stage the filmstrip lending facilities are small, and since there is only one copy of each item there could be delays in obtaining material.

4.5.2 The Department of National Education

Two departments of the Department of National Education supply resource material. These are the Land Service Youth Movement and the National Film Library.

The Land Service Youth Movement is not a major supplier of resource material (in fact it has only produced two sets of material, namely "The Sea Must Live" and "Garden Birds") but the aim is to increase output if funds allow it in the future. (It should be noted that the two sets of material produced are good examples of an holistic approach to environmental topics. Each set contains various booklets on different aspects of the topics. For example the set on garden birds contains booklets on gardening for birds, providing water for birds, supplementary feeding for birds, questions and answers on birds and a list of birds likely to be seen

in South African gardens.)

The National Film Library in Pretoria supplies 16 mm films, 35 mm slides and filmstrips and records on loan to all schools in South Africa. The 1981-1985 16 mm film catalogue lists films on a large variety of environmental topics. Of special interest to Environmental Education are the following : 39 films on general ecology, 9 on air pollution, 14 on water pollution, 4 on public health, 3 on soil conservation, 15 on nature conservation and 16 on water conservation. A large proportion of these films have an holistic approach, especially in marrying the "human" with the "non-human" environment. There are also a number of films made for Southern African conditions which give them a greater degree of relevancy. Filmstrips on topics relating to Environmental Education are less numerous than films. Nevertheless there are 16 which fall into this category.

4.5.3 In-service centres

The two in-service centres mentioned in section 4.4.2.1 both produce teacher guides for serving teachers. The College for Further Education produces notes for its students which contain sections on subject didactics. These are not made available to the teaching body as a whole, but may feed into the system via students of the College.

The Teachers' Centre in Johannesburg has as an aim the production of resource materials such as notes and slides. The Centre relies entirely on the teaching body for assistance. Over the last 5 years no Geography material and only one or two sets of notes on Biology teaching have been produced at this Centre. (In recent time the Centre has organised work parties who have produced

notes for the practical course in Biology for Standards 6, 7 and 8 which have been published by a commercial company.)

4.5.4 Universities and Colleges of Education

In 1978 the University of the Witwatersrand produced a guide for teachers on the organisation and management of fieldwork (Beckedahl, et. al., 1979). As far as can be ascertained this was the only resource material produced specifically for teachers by Transvaal universities or training colleges.

Some universities, for example the Randse Afrikaanse Universiteit, produce their own printed study guides for their education students. These include discussion on subject didactics. Other universities, such as the University of the Witwatersrand and training colleges such as the Johannesburg College of Education encourage their students to accumulate resource materials during their period of training. In these ways it is possible that resource materials may find their way into the schools via beginner teachers.

4.5.5 Materials from Biology and Geography teaching societies and other similar sources

The Geography Teachers' Association is the only Transvaal-based association for Geography teachers. This Association produces schemes of work for all secondary school classes in 1973/74. These schemes of work contained suggestions on methodology and bibliographies of recommended references. Nothing else has been produced by this Association since then. The Biology Study Committee of the Transvaal Teachers' Association has collaborated with the Association in the production of a few study guides. These have been mentioned in

section 4.5.3.

On a national level there are a few journals and magazines which are suitable for either Biology or Geography teachers. The journal of the Society for Geography (based in Stellenbosch) is the only one of its kind catering for Geography teachers (each journal contains a section on Geography teaching methods), while journals such as Spectrum and Archimedes (both publications of the Foundation for Science and Technology) cater inter alia for both teachers and students of Biology. (It is worth recording that these two science journals do not carry articles on Geography. This is not because the editors do not see Geography as a science, but apparently because no articles are submitted. This is another indication of thinking amongst Geographers in South Africa. "Geography" is a study on its own and is generally not considered as science which could and should be integrated with others.)

The South African Federation of Biology Teachers (which is associated with the Foundation for Science and Technology) is planning to produce regular newsletters which would include information on Biology teaching methods as well as information on the subject itself.

4.5.6 Newspapers

The Johannesburg based Star newspaper is the only Transvaal newspaper that runs daily educational columns for young readers. A regular feature of its education programme is articles related to Environmental Education. The newspaper also publishes an occasional newsletter for teachers which includes information on how best to use the educational articles.

4.5.7 The Departments of Nature Conservation

The Department of Nature Conservation of the Transvaal Administration produces an occasional magazine, entitled Fauna and Flora which contains general interest articles on the province's fauna and flora. All the schools in the T.E.D. receive free copies of this publication, as do the teachers' training colleges (Garstang, pers.comm.). In addition the Department produces occasional booklets relating to wildlife. Examples of these are A guide to the waterfowls of the Transvaal and Eagles of the Transvaal. These are supplied free to schools and colleges. The Department also produces educational charts of various kinds. For example there is a series of charts on threatened species such as the aardwolf, the agama lizard and the black-shouldered kite.

The Department of Nature Conservation has a supply of 16mm films on wild life topics, which it lends to educational institutions on request. An education officer from the Department usually brings the films and gives an introductory talk.

The National Parks Board, which has its head quarters in Pretoria, produces a general interest magazine (Custos) on its national parks. This is available to schools on subscription. It also produces a scientific journal (Kudu) which contains information of a more scientific nature, and which is also available on subscription. In addition to magazines and journals the National Parks Board produces information booklets on aspects of wild life in its parks. Examples of these are Frogs of the Kruger National Park and Trees of the Kruger National Park. The Parks Board has an extensive library of reference books which may be used by teachers.

Members of the library staff are also kept busy answering questions and/or requests from teachers and pupils in schools.

The National Parks Board may be criticised for the fact that there are no books on the ecology of the Kruger National Park. The Park has a number of clearly discernable habitats within its boundary (ranging from macro-habitats such as the knob-thorn open forests to micro-habitats such as those along the rivers) and these are of interest to many visitors, particularly school groups with knowledge of Biology and/or Geography. There is a clear need for booklets aimed at various interest groups and at various levels of complexity.

In conclusion it should be noted that there are no teacher orientated materials suitable for practical and/or fieldwork in any of the national or provincial reserves. Since there are relatively few experienced field officers in these reserves who are capable of running such activities (and in fact who cannot find time to run them owing to pressure of work), it is necessary that teachers be shown how to make the most out of visits with school groups. The education authorities and those of the provincial and national parks should collaborate in the production of such material. Not only would it serve to make school visits more meaningful, it could make a substantial contribution to Conservation Education in general.

4.5.8 The role of other non-profit seeking organisations

The Wildlife Society of Southern Africa recognises the need to supply teachers and/or pupils with resource materials related to Conservation Education. It has embarked on a programme to supply information booklets

(e.g. on trees, birds, mammals) and activity orientated material suitable for school children such as those on bird watching and the study of underwater life. As far as can be ascertained the Society is the only one of its kind producing such resource materials.

In addition to the materials just mentioned, the Wildlife Society produces two general interest magazines, African Wildlife and Toktokkie. Both these magazines provide information on South African wild life (plants, animals and their habitats), with Toktokkie being the magazine for younger readers.

(The role of the Wildlife Society with regard to extra-mural activities is discussed in chapter 5.)

4.5.9 Commercially supplied resource materials

There are a number of commercial companies which supply schools with resource materials ranging from wall charts to filmstrips. Once the material has been screened by the Transvaal Education Department's audio-visual section such material may be supplied by the Department on request.

A survey of materials offered by two companies revealed that, while there were adequate supplies of resources for both Geography and Biology, there was nothing which could be used to integrate these subjects, and topics of an ecological nature are generally neglected. A serious omission with regard to wall charts is that there is none with South African ecological themes. In particular there is none on South African ecosystems.

4.5.10 Summing up of resources

The Transvaal secondary school teacher would seem to be well supplied with 16 mm films, 35 mm filmstrips and

information relating to books and periodicals. These can be relatively easily loaned (with the possible exception of filmstrips from the T.E.D. library) or acquired through Departmental allocation. Wall charts and other similar material is also relatively easily obtained, but not always relevant to Environmental Education.

Guides to subject didactics which have been produced specifically for serving teachers are not widely available and are more difficult to obtain. Their production would seem to be sporadic and unco-ordinated. Those that are produced related mainly to schemes of work (Geography) and/or to discussions on particular topics (Biology). There is nothing on Conservation Education (with the possible exception of the Geography guide on fieldstudies) and nothing on holistic teaching, with special reference to studies of the environment. Material offered in this connection by organisations other than the T.E.D. (for example the Star and the Wildlife Society) is limited and not yet comprehensive. Commercially available material is subject orientated (e.g. Geography and Biology) and is of little direct relevance to Environmental Education. There is a need for much more teacher orientated material on subject didactics, especially with regard to holistic education, integration of suitable topics from various subjects and, above all, Conservation Education.

In section 4.4.1 the principles of self activity, motivation and interest, observation and perception and of environmental teaching were discussed. These principles imply a certain amount of outdoor activity (fieldwork) which could range from a few minutes' work to a day or more. A recent survey (Hurry, 1978: 23-24) revealed that many teachers (particularly in the Primary school) lack the confidence or know-how to arrange and conduct such activities. There is a need

for teacher orientated material related to outdoor activities, particularly in connection with Conservation Education.

The value of a healthy didactic situation with full interaction between teacher and learner cannot be over-stressed. Study guides should be of assistance to the teacher in the didactic situation with special reference to subject methodology, but most important of all is that all study guide material should encourage the teacher to develop the didactic situation to its full, and should contain examples of how this could be achieved.

4.5.11 Chapter f[illegible]mary

In this chapter an attempt has been made to assess the potential of high school teachers in the Transvaal for good Environmental Education.

In the first case the nature of good education was discussed generally. The main elements of good education are planned actions and the achievement of goals. With regard to Environmental Education specifically the planned actions include the judicious use of teaching aids, the use of the local environment in relevant situations, an holistic approach to environmental studies, the encouragement of self activity and other activities aimed at developing the "whole" child.

With regard to the training of teachers at the colleges and at the universities, it was found that while certain institutions appeared to be orientated towards Environmental Education, others were not. Two particular areas of concern were identified. The first was that a number of institutions do not give their students adequate training in fieldwork, and the second was that in most institutions there was a complete lack of subject integration.

In most institutions there was a complete lack of communication and co-operation between environmentally orientated subjects such as Geography and Biology. The student teachers were not therefore receiving training in holisitc education.

Research has shown that there are limited facilities for the in-service training of teachers. None of the courses that have been run over the past few years were specially orientated to Environmental Education, although parts could be said to be related to it.

Investigation of resource materials indicated that, while there are several good 16 mm films which are of direct relevance to Environmental Education, there is an almost complete dearth of material such as wall charts, study guides and other material which has been prepared for South African conditions.

The support that teachers receive in the form of resource materials from the Provincial Department of Nature Conservation with regard to resource materials is good, but limited. The National Parks Board offers less support, but is also able to assist teachers, on request, with information about the national parks.

The Wildlife Society of Southern Africa is the only non-government organisation that is assisting teachers, both with extra-mural activities as well as with resource materials.

CHAPTER 5

THE ROLE OF ADMINISTRATIVE, ADVISORY AND SUPPLEMENTARY ORGANISATIONS

5.1 Introduction

This chapter deals with the activities of both governmental as well as non-governmental organisations in the field of Environmental Education. These "activities" may be directed towards the development of Environmental Education as an educational process (as for example in the case of syllabus or subject committees) or they may be concerned with supplementary work such as extra-mural activities.

In this chapter the government organisations include subject and syllabus committees, auxiliary organisations within the Transvaal Education Department (such as the division of Youth Preparedness, the Veldschool movement and the Schools' Journey Service) and the Land Service Movement of the Department of National Education. The provincial Department of Nature Conservation, the provincial museum service, and the National Parks Board also fall into this category.

The only non-governmental organisation which has full-time staff occupied with Environmental Education is the Wildlife Society of Southern Africa, and the contribution of this Society is also assessed in this regard.

5.2 SUBJECT COMMITTEES AND/OR SYLLABUS COMM.TTEES

5.2.1 The work of the committees

The Transvaal Education Department has study committees for both Geography and Biology. Each committee consists of members drawn from a wide range of experiences and expertise. Representatives from the inspectorate, the teachers' training colleges, the Education Bureau, the universities (Botany and Zoology) and the teaching body make up the committees.

The funcation of each study committee is basically 5 - fold :

1. to meet occasionally to discuss current teaching problems, new teaching techniques, etc.;
2. to produce resource material for teachers especially with regard to problem areas;
3. to organise occasional in-service courses for teachers;
4. to develop new national core sullabuses when called upon to do so.
5. to consider new core syllabuses and to adapt them for Transvaal conditions.

The role of the subject committees in in-service courses has been discussed in section 4.4, and in the preparation of resource material in section 4.5. In this chapter attention will be focused on the work of the subject committees with regard to syllabuses.

5.2.2 The national core syllabuses

The school syllabuses for all standards from Grade 1 to Standard 10 are based on national core syllabuses drawn up by select committees. Although individual education departments may change introductory statements, local examples and other details of the core syllabuses, the basic contents of the syllabuses may not be changed.

The development of core syllabuses for Biology and Geography is usually attended to by different provinces. During 1979/80 the national core syllabus for Geography was the responsibility of the Transvaal, while the core syllabus for Biology was the responsibility of Natal.

In the past none of the members of the two core syllabus committees (i.e. Geography and Biology) have met to discuss common-ground topics, practical work and fieldwork overlaps, or directions which the subjects are taking in their development. Biology and Geography are the two school subjects most fundamentally involved with the environment, and a lack of interaction between the core syllabus committees limits holistic teaching and must blunt the efficiency of each in their approach to Environmental Education. (The lack of complementarity between the syllabuses of Geography and Biology has already been discussed in Chapter 3. A major cause of this is most certainly the lack of communication between the national core syllabus committees.)

5.2.3 Core syllabuses for the Transvaal

The subject committees have the responsibility of adapting national core syllabuses to Transvaal conditions. This process usually involves the inclusion of prefatory remarks, an elaboration of the aims and objectives and the inclusion of Transvaal examples where applicable.

Members of the Biology and Geography subject committees in the Transvaal do not meet formally to discuss common ground topics, areas of overlap or other areas of common interest such as fieldwork and/or practical work. As has been discussed in Chapter 3 there is no obvious correlation between the content of the syllabuses of Biology and Geography in the high school, and there is no cross-referencing of content that could be made complementary. If there were contact between members of two committees these matters could be rectified.

5.3 AUXILIARY SERVICES AND ORGANISATIONS

The Biology and Geography teachers at a school are not alone in their task of teaching. There are a number of people in special posts and a number of organisations that can be of assistance to them. In this section emphasis is placed on those people or organisations which are or can be of direct assistance in teaching pupils more about Conservation Education. Certain of these have been mentioned in connection with the provision of resource materials (for example the Department of National Education and the Wildlife Society of Southern Africa) while others (such as the Veld Schools) have not yet been discussed.

In section 4.4.1 the didactic principles of observation and perception and environmental teaching were discussed. It was established that direct experience of the environment is essential for effective learning. Teacher abilities and teacher training in fieldwork exercises were discussed in section 4.5 The conclusion was reached that teachers need more guidance in fieldwork activities. Auxilliary services such as the Veld Schools, the Land Service Movement and the Wildlife clubs scheme of the Wildlife Society are involved with outdoor education and in this section their contributions to Environmental Education in general and Conservation Education in particular are discussed.

5.3.1 Auxiliary subjects, posts and organisations within the Transvaal Education Department

5.3.1.1 Educational Guidance

The Educational Guidance programmes of the T.E.D. has two main divisions. These are Vocational Guidance and Youth Preparedness. Youth Preparedness in turn may be also divided into two sections, namely Moral Preparedness and Physical preparedness. In a normal high school time table moral preparedness is allowed 1 period per week, while Physical Preparedness has two periods per week.

Educational Guidance is found in both Primary as well as Secondary schools. In the syllabus for the secondary school the purposes of Moral Preparedness are stated as : "To stimulate the pupils' interest through studying and group discussions and to offer them the opportunity of formulating their own point of view with regard to matters which lie outside the curriculum, but which are of great importance to them" (T.E.D. Circular minute 136 of 1977). It would seem that, should teachers wish

to do so, a reasonable amount of Environmental Education could be incorporated into the school programme of Moral Preparedness. However, an investigation into the syllabus for Moral Preparedness suggests that Environmental Education is not one of the aims of the programme.

The Moral Preparedness syllabus is divided into three sections, namely Citizenship, Human Relations and Values in Life. The only reference to environmental topics is in the Junior Secondary syllabus where "South Africa - its extent, beauty and riches" is mentioned under citizenship.

The Physical Preparedness part of the Youth Preparedness syllabuses emphasises para-military activities (for example nursing, fire-fighting, self defence for girls and similar activities within the cadet programme for boys). The syllabus for girls does list "other activities" for girls which could include "club work". It is not known whether this "club work" could include clubs such as nature clubs, science clubs or the like.

In conclusion it may be said that the Educational Guidance programme for secondary schools has the potential to assist with Environmental Education, but that the contents of the syllabuses would seem to be more discouraging than encouraging.

5.3.1.2 Head of the Department of Educational Guidance

In the hierarchy of posts at secondary schools there is the post of Head of Department - Educational Guidance. According to the inspector for Youth Preparedness (Connacher, pers.comm.) this post is essentially related to the "total development" of the child at school. This could (and perhaps should) mean that this Head of Department should be involved with the starting and running

Favourable comments (Selected for their relevance to Environmental Education.)

(i) Pupils are exposed to the natural environment. They are taken out of the built environment into a world with which they are not familiar. There is a potential to develop new relationships with the natural world.

(ii) Veld Schools are an enjoyable experience.

(iii) Group discussions are encouraged ... and well conducted.

(iv) Obstacle courses provide stimulating, problem-solving situations.

(v) The Veld Schools are all located in beautiful surroundings.

(vi) Camping out at night provides an unforgettable experience. It brings the children into direct contact with the natural world.

(vii) Children are encouraged to be aware of nature. The mottoes of the Veld Schools also echo this concern. Two examples are "Conserve, Protect and Cherish" and "Cherish and Conserve".

Areas of concern (Selected for their relevance to Environmental Education.)

(i) The title of Veld School is misleading. many of the activities could as well be done at urban sites. There was not enough emphasis on the "veld".

(ii) A limited amount of time was spent studying the natural environment. (In one case only 5 hours in a 7 day programme - part of which was sandwiched in between two obstacle courses.)

(iii) When pupils were in the veld, opportunities were lost for Environmental Education. For example a tracking game involved following pieces of paper and human footsteps; a walk between two places became a "hike" rather than a "nature trail"; a weekend in the Zoutpansberg (away from the main camp) was spent mainly on obstacle courses and "boere sports".

(iv) Not enough individual activity or group work was done. Lectures were given on birds and plants, inside a hall, rather than allowing the pupils to find things out for themselves, or under guidance of a teacher, in the natural environment.

(v) A number of Veld School staff were clearly "nature" orientated rather than "environment" orientated. They showed by the talks that they saw man as separate from "nature".

To the areas of concern listed by Buwalda may be added an area of concern given by the Wildlife Society in 1978 (Hurry, 1978). This was that there are apparently no meaningful pre-Veld School or post-Veld School activities (particularly with regard to Conservation Education).

In summing up the discussion on favourable comments and areas of concern it is apparent that Veld Schools have

of school clubs, at least in an advisory capacity. In the context of Environmental Education he or she could be of assistance with science clubs, cultural clubs, wildlife clubs and others which could supplement work being done through the subject syllabuses.

5.3.1.3 Veld Schools

The Transvaal Education Department has 10 Veld schools nine of which are in the Transvaal and one is in Natal. Each school has boarding facilities for both boys and girls and large numbers are catered for. (For example the Martha Glatthaar Veld School at Groot Marico can accommodate 180 pupils, while the Sommerreg Veld School near Ogies can accommodate 140.) Each school is staffed by a school principle, other teaching staff and catering staff.

The Veld School movement falls under the Transvaal Education Department's section for Educational Guidance. It was developed to encourage young people to "face up to the problems which beset modern youth" and to have an "experience of nature (and to) experience healthy adventures." (Transvaal Education Department, 1979 (a): 5) Buwalda (1979:1-4) discusses the aims and objectives of the Veld School Movement in detail :

1. To lead the pupil on the road to maturity and/or adulthood

   In discussing this aim Buwalda mentions discipline, responsible decision making, freedom of thought and expression, the development of a sense of belonging, the development of respect and understanding and the realisation of one's own potential.

2. To encourage the pupil to be a better South African

   Here Buwalda mentions improving race relations; attitudes to work and work situations; improving attitudes to scenic beauty, pollution or littering, and discussions on South Africa's enemies with special reference to communism.

3. To encourage the pupils to become better Christians

   This is achieved by the Veld School staff setting good examples; by using scripture readings and prayer at suitable opportunities; by discussing the"wonder of nature" and "the wonder of creation" in the context of God's creation.

4. To provide an adventure

   Different "adventures" ranging from obstacle course to hiking are provided for the pupils.

5. To show that a threat to South Africa's existence and stability does exist and what we can do about it

   This is handled by discussions on race relations and the threat to communism.

6. To provide the pupils with an opportunity to get to know and appreciate nature

   A number of points are mentioned in trying to achieve this aim. They include slide shows, nature walks, museum visits, sleeping out,

explanations of natural phenomena and discussions on pollution and littering and how it affects man and nature.

7. To prepare young people for emergencies which may take place

   Here the emphasis is mainly on first aid, fire fighting, bush survival, survival in the sea and similar topics.

8. To assess leadership qualities

   These are assessed by observing the pupils during adventure situations, discussions, peer group assessment, etc.

9. To impart knowledge

   This is a "blanket" aim of the whole course.

The Transvaal Education Department lists some of the problems which it sees the child having to cope with today (Transvaal Education Department (1979 (b):5; Pasques 1978:1-9). These include the accelerated pace of life, increasing mechanisation, confusing ideologies which affect the child through communication media, increasing confusion regarding norms and values, and uncertainty and negativeness regarding religious life.

On consideration of the aims and objectives of the Veld schools and of the remarks by the Transvaal Education Department concerning today's "problems", it would seem that Veld schools are, quite justifiably, child orientated. The aims and objectives of the Veld schools are directed towards helping the child live in society and adjust to its problems. From the

point of view of Environmental Education in general and Conservation Awareness in particular the following criticisms may be levelled at the aims and objectives :

(i) There is no general aim which is specially linked to Environmental Education. Aspects of Environmental Education are mentioned in connection with other aims such as aims 2, 3 and 6 (above).

(ii) The aims and objectives reflect a mechanistic rather than a holistic approach to the environment. For example references to "man" and "nature" (aim 6) and "the wonder of nature (aim 3) suggest that man is separated from "nature" and not an integral part of it. In aim number 2 reference to "scenic beauty" and littering and pollution" clearly suggest consideration for isolated (emotive?) issues relating to the environment, rather than for the environment as a whole.

It is beyond the scope of this study to discuss in detail the pros and cons of Veld Schools. In 1979 Buwalda compiled a report based on the experiences of college students at various Veld Schools and on the experiences of a number of school teachers who had led school groups to Veld Schools (Buwalda, 1979). The favourable comments and criticism may be used to obtain some insight into the role of the Veld Schools in Environmental Education and more particularly into Conservation Awareness. (In compiling the report it became apparent to Buwalda that some Veld Schools were achieving more than others in the field of Environmental Education. Differences in achievement were due, in the main, to the interests and abilities of the staff of each Veld School.)

Favourable comments (Selected for their relevance to Environmental Education.)

(i) Pupils are exposed to the natural environment. They are taken out of the built environment into a world with which they are not familiar. There is a potential to develop new relationships with the natural world.

(ii) Veld Schools are an enjoyable experience.

(iii) Group discussions are encouraged ... and well conducted.

(iv) Obstacle courses provide stimulating, problem-solving situations.

(v) The Veld Schools are all located in beautiful surroundings.

(vi) Camping out at night provides an unforgettable experience. It brings the children into direct contact with the natural world.

(vii) Children are encouraged to be aware of nature. The mottoes of the Veld Schools also echo this concern. Two examples are "Conserve, Protect and Cherish" and "Cherish and Conserve".

Areas of concern (Selected for their relevance to Environmental Education.)

(i) The title of Veld School is misleading. many of the activities could as well be done at urban sites. There was not enough emphasis on the "veld".

(ii) A limited amount of time was spent studying the natural environment. (In one case only 5 hours in a 7 day programme - part of which was sandwiched in between two obstacle courses.)

(iii) When pupils were in the veld, opportunities were lost for Environmental Education. For example a tracking game involved following pieces of paper and human footsteps; a walk between two places became a "hike" rather than a "nature trail"; a weekend in the Zoutpansberg (away from the main camp) was spent mainly on obstacle courses and "boere sports".

(iv) Not enough individual activity or group work was done. Lectures were given on birds and plants, inside a hall, rather than allowing the pupils to find things out for themselves, or under guidance of a teacher, in the natural environment.

(v) A number of Veld School staff were clearly "nature" orientated rather than "environment" orientated. They showed by the talks that they saw man as separate from "nature".

To the areas of concern listed by Buwalda may be added an area of concern given by the Wildlife Society in 1978 (Hurry, 1978). This was that there are apparently no meaningful pre-Veld School or post-Veld School activities (particularly with regard to Conservation Education).

In summing up the discussion on favourable comments and areas of concern it is apparent that Veld Schools have

the potential to make a substantial contribution to Environmental Education with particular emphasis on Conservation Education. It would appear that certain Veld Schools are already doing more than others in this regard. In order to achieve more of their potential there should be improvements in three general areas. In the first place there should be an improvement to the general aims and objectives. These should be more specific to give guidance to the Veld School staff. Secondly there should be a re-organisation of the time table to include more carefully structured environmental activities. Finally there should be an improvement in the pre-School as well as the post-School activities, particularly in Conservation Education. In this connection better use could be made of the Veld School Regional Assistants (at present there is a regional assistant in each of the administrative regions) who could give guidance to teachers at schools with regard to research before, and write-ups after, each visit to the Veld School.

Between 1975 (the year in which Veld Schools were started) and 1979, 194 954 people attended Veld school programmes. In 1979 alone the figure was 53 902. The Transvaal Education Department has a policy of concentrating on certain groups of pupils and college students. The largest number of pupils comes from Standards 5 and 8. Other groups considered important are the trainee student teachers (for discussion on this see section 4.5.1) and so-called "leadership" groups. (Pupils for leadership programmes are specially selected for their leadership qualities and may come from any class in the Secondary school.) Most school groups attend Veld Schools during the term time, although leadership and other special courses are held during school holidays.

Although the figure of 53 012 in 1979 is impressive it should be remembered that the total number of all pupils

in Transvaal schools is very large (in 1979 there were approximately 990 thousand pupils in primary and secondary education) and that the percentage of pupils who visit Veld Schools annually is relatively small. (in 1979 it was approximately 5%.)

In realising that it is not possible for more pupils to attend Veld schools each year, the Transvaal Education Department concentrates on standards 5 and 8, thus endeavouring to ensure that every pupil experiences at least two Veld Schools in his or her school life. Although this is a highly laudable aim, it can be argued that two outdoor experiences of the Veldschool type will not be sufficient to improve Environmental Education significantly. On the other hand Irwin, working with young people who had attended Wildlife Society courses at the Umgeni Valley ranch in Natal, found that relatively brief exposures (sometimes as short as a weekend) to meaningful programmes can make substantial improvements to Conservation Education (Irwin, pers.comm.). In the light of his findings the Veld Schools have the potential to make a valuable contribution to Conservation Education in South Africa, providing improvements are made to the aims and objectives and to the school time tables.

5.3.1.4 The Schools Journey Service

The Schools Journey Service, with its head-quarters in Pretoria, arranges extended field trips on behalf of teachers.

The T.E.D. has a number of hostels and other overnight facilities at its disposal. Three of these (in Pretoria, Sabie and Johannesburg) are owned and controlled by the T.E.D., while the others are first inspected by the Education Department before approval is granted for their use by official school groups. (Van Niekerk, pers.comm.

There is no limit, at either end of the scale, to the sizes of groups which the School Journeys Service transports, providing there is adequate accommodation available. There is also no limit to the distances travelled, although in practice a shortage of time makes long trips impractical.

In 1979 nearly 300 000 pupils and students made use of the Service. Of this number of 80% were from the primary school, and less than 20% were from the secondary school. Relatively few pupils from the Senior Secondary school make use of the Service.

The Schools Journey Service does not provide speakers or activity organisers for schools. Its only function is to transport pupils and to arrange for accommodation. Since there is an acute shortage of trained teaching staff at the nature and game reserves, as well as a shortage of interpretive centres, the onus is on the school teaching staff to conduct talks or fieldwork. Teachers need to know more about the areas they visit and in this regard there is a shortage of materials on the ecology of nature and game reserves, as well as on the running of field activities in such reserves. (For further discussion on this see section 5.3.3.)

5.3.2 The Land Service Movement

The Land Service Movement falls under the Department of National Education, whose headquarters are in Pretoria. Although the movement itself is State controlled, membership is entirely voluntary, and is open to all White children over the age of 10.

The main object of the Land Service movement is "the conservation, utilisation and development of our country's natural resources, its culture and its human

potential"(Department of National Education, undated). There are 8 specific objectives (these are quoted in full from the official handbook on the Land Service movement (Department of National Education, undated):

1. to kindle in our youth a love of the land and to teach them to utilise it wisely; to conserve the soil and the animal and plant life of the country, which are our common heritage and which we have to cherish, so that it may be passed on to future generations;

2. to make out young people acutely aware of the dangers of pollution (of water, of air, and of land in general), and to inspire them to active efforts to combat this menace;

3. to give young folk an opportunity of mixing with others, to develop a team spirit, and to work together towards a common goal, or order to foster a spirit of true independence and initiative, so that they may be properly equipped to take their place in the community as responsible and independent citizens;

4. to foster in our young people a love of nature and an awareness of their cultural heritage, and to develop this awareness by way of individual and group activities, while teaching them at the same time to understand and respect the culture and customs of other groups as well;

5. to help young people to develop a sense of inderpendence, responsibility, leadership and initiative, so that they may be equipped, mentally and spiritually,to grapple with the problems and challenges of this present-day in which they have to make their way;

6. to foster these qualities by encouraging practical activities, to help our youth to lead full and useful lives and to lead them towards responsible adulthood;

7. to organise and effectively co-ordinate all interested parties, so that they may co-operate constructively with the State towards the general well-being of the country as a whole;

8. to emphasise the religious aspect of the movement and to give the young people an opportunity of developing their religious sense by fostering in them a love of God the Creator, of their fellow men, and of their country, and by teaching them the value of labour and service to the community.

It is of interest to note that these aims are far more environmentally orientated (as opposed to "nature" orientated) than those of some school syllabuses. They also contain objectives which are stated in behavioural terms, something which the school syllabuses could well emulate. A final point about the aims is that they are related to the "total" child in his or her "total" environment (see the discussion on the didactic principle of totality in section 4.4.1). In this way it would seem that the Land Service movement has an important supplementary role to play in the school situation where there is a tendency for classes to be subject orientated.

In order to realise these aims and objectives Land Service Clubs with adult leadership are encouraged in schools. In addition there are a number of cultural officers who are responsible for the promotion and development of club activities.

Land Service clubs usually meet during breaks in the school time-table or after school. Activities include cooking, sewing, drawing (mainly for the girls), woodwork, arts and crafts and music as well as activities relating to nature conservation such as slide shows, talks, sketching, painting and even debating. There is ample opportunity for Biology and Geography teachers to become involved in activities which concern their subjects in general and Conservation Education in particular. In 1979 there were 160 Transvaal schools with Land Service Clubs, approximately 35% of which were in secondary schools. Since there are approximately 240 secondary schools it means that just under 25% of the secondary schools have Land Service Clubs. (Alberts, pers. comm.)

In addition to Clubs at schools the Land Service movement arranges and conducts holiday camps at its many educational sites scattered throughout the country. There are eight of these sites in the Transvaal (for example at Roodeplaat near Pretoria, Potchefstroom, Hartebeespoort Dam and at Pietersburg). At these camps a good range of activities takes place, with emphasis being placed on soil and "nature" conservation (sic.). In 1979 6 146 children, 3793 of whom were from secondary schools, attended Land Service camps. Since there were approximately 175 000 pupils in Transvaal secondary schools in 1979 it means that approximately 2% of the pupils attend Land Service Camps annually. Although this figure may be small there is a follow up system in the form of school clubs which has the potential to develop interest further amongst the school population.

5.3.3 The role of non-governmental organisations (NGO's)

The Wildlife Society of Southern Africa is the only NGO which plays a part in the extra-mural activities related

to Environmental Education.

The Society has a number of education officials. At the national level there is a Director of Environmental Education, a Wildlife Club Organiser and a Wildlife Club Extension Officer. In the Transvaal there are also two Trails Officers and one Education Officer. The Director of Environmental Education oversees the Society's national programme, the two Wildlife Clubs officers are involved with encouraging the formation of Wildlife Clubs at schools, the Trails Officers conduct trails in various nature reserves in the Transvaal, and the Education Officer visits schools and conducts programmes at suitable venues.

Since the Wildlife Clubs scheme was started in the Transvaal in 1978 41 schools have started clubs. Of these, 19 are in primary schools and 22 in high schools. Of the 22 high schools 16 are in T.E.D. schools and the remainder in private schools.

The Society owns or manages three nature reserves which are used for Environmental Education courses. One of these is in Natal and two are in the Transvaal. The two Transvaal reserves are the Abe Bailey reserve near Carletonville and the Ben Lavin reserve near Louis Trichardt. The Society's Trails Officers run Environmental Education courses for all race groups at these two reserves. At the moment provincial school children attend these courses during school holidays or over weekends, while private school pupils attend courses during school term.

The Wildlife Society produces various resource materials which are suitable for Environmental Education at schools. Firstly, there are the two magazines, African Wildlife AND Toktokkie. The former is the Society's general

interest magazine, while the latter is specifically for young people. Secondly, the Society produces various booklets which are relevant to Environmental Education. These include information booklets on trees, antelope and birds. There are other booklets of more direct relevance, for example "Bird Streaking", a novel approach to observing birds, and "Wildlife, the Law and You", a booklet which interprets the provincial nature conservation by-laws.

In the course of the survey of formal education in 1978 (Hurry, 1978) the Wildlife Society interviewed officials from all the education departments. Without exception the opinion expressed by these officials was that education departments would welcome the contributions that NGO's could make to Environmental Education in schools in their care. It is a pity therefore that there is only one NGO in the Transvaal which is in a position to be of assistance. The fact that only 41 of the 990 schools in the T.E.D. have Wildlife clubs demonstrates the nature of the task that faces NGO's in making their contribution effective in this field.

5.3.4 The Transvaal Division of Nature Conservation

The Transvaal Provincial Administration makes a substantial contribution to Environmental Education with special reference to Nature Conservation. (Garstang, pers.comm.)

The Division of Nature Conservation has a Senior Professional Officer, a Professional Officer and a Nature Conservation Officer whose function it is to talk to interested people at various levels (from school children through to adult groups), to produce resource material (from printed material to slides and films) and generally to make use of every opportunity to develop nature conservation awareness in different groups. In addition there are Nature Conservation Officers at the

various nature and game reserves under the care of the Transvaal Administration who may be available for talks and discussions with visiting schools or other groups.

The Transvaal Division of Nature Conservation is the only department in South Africa with interpretive centres in some of its nature reserves. (An interpretive centre is one which has been especially developed to explain the ecology of the nature reserve concerned. It differs from the more common nature reserve museum (such as is found at Skukuza in the Kruger National Park) in that it explains the ecology holistically, giving the visitor a global picture of the reserve's ecology.) There are interpretive centres at the Blyde River reserve, the Roodeplaat dam reserve and the Suikerbosrand reserve. (The Division has also provided an auditorium at the Suikerbosrand reserve specially for lectures and filmshows to visiting groups.) Interpretive centres are important for two reasons. Firstly they provide an holistic picture of the reserve, thereby encouraging the observer to think in this way, and secondly they are a form of training for teachers since they provide an example of how ecosystems can be studied and this can be applied in other situations.

5.3.5 The role of provincial museums

The Transvaal Museum in Pretoria has an educational division with an education officer. Film shows and lectures are arranged for children of all races. Topics range from specific subjects such as lectures on certain animal species to broadly based discussions of an ecological nature.

It is an unfortunate fact that the Pretoria museum is the only one of its kind in the Transvaal. There is no natural history museum on the densely populated Witwatersrand which school children could visit as part

of their education. The omission of such a public service by the Province must surely be one of the most serious in education in general and Conservation Education in particular.

5.3.6 The National Parks Board

The National Parks Board offers educational facilities in the parks under its control. In the Transvaal these are available mainly in the Kruger National Park. Each camp has film show facilities, and films on various aspects of nature conservation are shown regularly. There is an educational officer at Skukuza whose function it is to talk to or show films to the thousands of Transvaal school children who visit the Park annually with the School Journeys Service. (In 1979 there were approximately 10 000.)

The Parks Board also runs three wilderness trails in the Kruger National Park (the Wolhuter, the Nyalaland and the Olifants trails). Persons over the age of 12 years go on these trails in groups of not more than eight. Experienced trails officers conduct the trails, and there is an emphasis on Conservation Education. Since the trails were only begun in 1979 a relatively small number of people have been on them. It is expected that the numbers will grow, but even so it is not possible to take more than 1 000 people per annum, because of the restriction placed on the number of participants for each trail (Immink, pers.comm.).

The Kruger National Park has a museum and reference library for visitors. Although the reference library is good the museum unfortunately is not. The displays are unco-ordinated and rather specialised and there is nothing on the ecology of the reserve. There is an urgent need for at least one interpretive centre in the Kruger National Park, especially as there are so many

school-going visitors.

5.3.7 Chapter Summary

The syllabuses for school subjects such as Biology and Geography are drawn up by separate syllabus committees. At the moment these committees do not meet formally and the opportunity for an improved holistic approach to the environment via subject integration is lost.

The Education Guidance programme of the T.E.D. has the potential to be more effective in the field of Conservation Education. At the moment there is little emphasis on Conservation Education in the syllabus for Educational Guidance, and little work would appear to be done in this field. The Head of Department of Educational Guidance in each school could play a positive role in Conservation Education through the encouragement of environmental clubs. At the moment this is implied rather than stated specifically in his/her job description.

The Veld Schools have the potential to supplement the work being done in the classroom. In order to achieve this potential there is a need for more clearly stated aims and objectives (for Conservation Education) and a reorganisation of the Veld School timetable. The Land Service Movement would seem best orientated to the improvement of Conservation Education in schools. Unfortunately the movement does not involve very many pupils or teachers.

Non-government organisations such as the Wildlife Society of Southern Africa attempt to provide materials and give support to schools through Wildlife Clubs. At this stage their contribution is relatively small.

The provincial and national conservation authorities offer assistance in various ways. At this stage the numbers of field officers and other personnel are small, limiting their contribution. The Transvaal Division of Nature Conservation has three interpretive centres, while the National Parks Board has none. Since interpretive centres not only offer information on local areas, but also give guidance to teachers on the approach to ecosystem studies, they are most important in nature and game reserves.

There is only one Provincial natural history museum in the Transvaal (in Pretoria). There is an urgent need for more natural history museums in other parts of the Province, especially on the Witwatersrand which has by far the greatest concentration of school children.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

6.1 Frames of reference

6.1.1 Conclusions

Chapter One identified the problem that education departments in general are being blamed for an apparent lack of environmental awareness amongst South Africa's young people. In the Transvaal there is little evidence to support or reject this accusation. Since Biology and Geography are both environmental sciences it was decided to make them the focus of attention for this study, and to investigate the contribution that the teaching of each of these subjects makes to Environmental Education in Transvaal Secondary schools.

A secondary problem which other studies had identified was that various officials within the education departments had different interpretations of the term "Environmental Education", and also had different ideas on the aims and objectives of Environmental Education.

In order to establish clear terms of reference at the outset of the study, Chapter Two is devoted to a discussion of terms. Of particular relevance is the discussion on the terms "environment" and"Environmental Education".

The environment is seen in its totality. It consists of the sum of all external conditions and influences affecting the life and development of the individual.

A basic component of the environment is the bio-physical component. This is seen in ecological terms with man being an integral part of an ecosystem. He is affected by elements and processes within the ecosystem in much the same way as other organisms. At the same time man influences his ecosystem through "in-puts" and "take-outs". In his pre-agricultural days man did not do much to harm the equilibrium of his ecosystem, but as his technology developed, particularly his industrial technology, the "in-puts" and "take-outs" have had an increasingly adverse effect on it. As "medical" man, man has been able to control deaths through disease and injury, resulting in a population explosion which has further threatened the environment with a concomitant increase of "in-puts" and "take-outs". Much of the damage to the bio-physical environment is the result of ignorance or uncaring actions. It is essential for the health of the bio-physical world that people be educated with regard to this world. It is only through education that people will become aware of the bio-physical environment in which they live, and be motivated to actions which will protect the health of that environment.

Environmental Education is defined at length in Chapter Two. It is not seen as a separate school subject, but rather as an inter-disciplinary process which seeks to use relevant information, activities and skills from the various subjects to produce in young people awareness and motivation for the action mentioned above. Because of its importance, Environmental Education should be at the core of the curriculum, and be guaranteed a place in every school subject. Since Environmental Education concerns the "total" environment every effort should be made by teachers of the various subjects to integrate material as often as it is required. In this way topics would be dealt with

holistically, and a broad picture presented to the pupil. (Holistic education is discussed in detail in section 2.5.3.)

Since this study emphasises teaching which is centred in the bio-physical world, the term "Conservation Education" is used to describe educational processes which concentrate on the bio-physical world.

Fieldwork provides an opportunity for the pupil to become involved with the environment, intellectually and spiritually. It is considered essential for effective Environmental Education in general and for Conservation Education in particular.

6.1.2 Recommendations

Because Environmental Education is vital to the survival of the bio-physical world as the home of man, it is recommended that the Transvaal Education Department :

(i) issues a statement on the importance and value of Environmental Education and that such a statement be contained in the Principal's handbook or some other suitable publication;

(ii) through its various activities and actions, encourage its teachers to explore the use of different school syllabuses as vehicles for Environmental Education;

(iii) encourage the growth and development of holistic teaching in Secondary Schools within its care.

6.2 The aims of school syllabuses

6.2.1 Conclusions

Chapter Three deals with discussions on the role that the school syllabuses for Biology and Geography can play in Environmental Education. It was found that a number of aims related to the development of environmental knowledge and the creation of sound attitudes to the environment. Generally speaking the Junior Secondary syllabuses for both Biology and Geography had more comprehensive aims in this respect. The study revealed a lack of objectives stated in behavioural terms. Since the implementation of a teaching programme is influenced by the presence or absence of such aims, it is important that aims be introduced which stipulate what the expected behaviour of the pupils will be (particularly in Environmental Education).

The study also revealed that the general "across-the-board" aims for the school phases as a whole were vaguely stated and non-specific.

6.2.2 Recommendations

Since the aims and objectives for the various syllabuses should give the teacher guidelines along which to work, it is recommended that they be reconsidered in the light of what has been said both in the study and in the conclusions above.

(i) The aims and objectives of all Biology and Geography syllabuses should be re-assessed with regard to environmental knowledge, attitudes and, most important of all, action.

(Here particular attention should be paid to the Senior Secondary syllabuses, particularly Biology.)

(ii) It is recommended that the Transvaal Education Department draw up a list of aims and objectives for the Secondary School phase as a whole. It is further recommended that this list contains aims and objectives relating to Environmental Education. (Such a list could be contained in the principal's handbook or similar publication.)

6.3 THE CONTENTS OF SCHOOL SYLLABUSES

6.3.1 Conclusions

Chapter Three continues with a discussion of the contents of school syllabuses for Biology and Geography.

The study revealed that there is no obvious correlation between Biology and Geography :

(i) Although there are numerous areas of overlap between the two, there is no system of cross-reference in any of the four syllabuses. This is particularly regrettable in the case of the Junior Secondary syllabuses, since both Biology and Geography are compulsory subjects at this level.

(ii) The contents of syllabuses do not complement each other in any respects. There is no obvious attempt to link material for similar years of study.

A lack of correlation, even at an elementary level, is anti-holistic for at least two reasons. Firstly it

reduces the pupils' chances of seeing Biological or Geographical topics "in the round", and secondly it does not encourage the teachers to think or teach holistically.

The study also showed that there are certain lacunae in both the Geography as well as the Biology syllabuses, especially in the Senior Secondary phase. Some of the omissions from the Biology syllabuses are a study of abiotic factors in the ecosystem, and the use of maps and photgraphs to show distribution, while in the Geography syllabus biotic elements have been omitted. These omissions also reduce the syllabuses potential for developing an holistic attitude to each of the subjects concerned.

A final point that the study brought to light was that, although ample allowance has been made for fieldwork activities, (and for practical work) there is a serious shortage of time and opportunity for conducting fieldwork.

6.3.2 Recommendations

Since holistic education is considered important to effective Environmental Education it is recommended :

(i) that syllabuses for Biology and Geography be made to correlate to a far greater extent, especially in the Junior Secondary phase;

(ii) that cross-references be used in the syllabuses within the same phase;

(iii) that the syllabuses contain hints to teachers of Biology and Geography as to how they could collaborate with each other on common ground topics or supplementary information.

(Note : These recommendations do not imply that Biology and Geography lose their respective identities and merge with each other, but that, in relevant areas only, teachers of the two subjects collaborate on the general approach.)

(iv) that the syllabus committees for both Geography and Biology re-examine the syllabuses for the Senior Secondary phase, with a view to adding to those syllabuses the necessary material in each case to create an holistic picture of the field of study. In the case of Geography it is recommended that more biotic elements be included, while in the case of Biology the abiotic factors should be emphasised more. There is also a need to include mapping and photograph interpretation in the Biology syllabus.

Because fieldwork is considered an integral part of Environmental Education it is recommended :

(v) that the total lengths of school syllabuses be reduced to allow more opportunity for fieldwork studies. (This would also allow for a greater degree of holistic teaching.)

6.4 PRE-SERVICE TEACHER TRAINING

6.4.1 Conclusions

Chapter Four deals with the practice of teaching. In this chapter at attempt has been made to assess the potential of teachers in Transvaal High schools for Environmental Education. This was done by assessing teacher training programmes for Biology and Geography teachers.

In general it was found that most departments of either Biology or Geography were aware of the need for Environmental Education. A number of departments encouraged a multi-disciplinary approach to environmental studies and gave their students training in the compilation and management of fieldwork programmes or projects. There are, however, a number of departments who do not give their students adequate training in fieldwork. In addition there are many institutions where lecturers from the Biology and Geography departments do not meet at all to discuss common-ground topics or activities. Until all the teachers' colleges accept the fact that Environmental Education involves a multi-disciplinary approach, and that outdoor fieldwork is part of this approach, there will continue to be problems surrounding effective Environmental Education in the Transvaal schools.

6.4.2 Recommendations

The teachers' training colleges and universities provide the foundation on which the in-service teacher builds future teaching expertise. It is vital in Environmental Education that two areas of instruction should not be overlooked. These are the areas of holistic teaching and fieldwork management. With this in mind it is recommended that :

(i) departments of Biology and Geography within the colleges and universities provide models of holistic teaching by collaborating together on common ground topics or supplementary information or skills;

(ii) all departments of Geography and Biology should give extensive training to the students in the compilation and management of fieldwork activities.

6.5 IN-SERVICE TEACHER TRAINING AND FACILITIES

6.5.1 Conclusions

The study revealed a dearth of in-service training facilities, although there is a College of Further Training, run by the T.E.D., in Pretoria, there is no centre which offers day to day advice, training or resource material for teachers. Various organisations run in-service courses in both Geography and Biology. Biology courses have been fairly frequent in recent years, but Geography courses have been sporadic. Although there have been programmes containing elements of Conservation Education, there has not been one programme to date which has catered especially for the teaching of Conservation Education.

The study revealed some of the problems of fieldwork activities. Few teachers seem to be equipped and willing to conduct outdoor fieldwork projects. There also appears to be a shortage of venues for fieldwork. Few schools in the Transvaal seem to have developed part of their grounds as outdoor fieldwork centres.

6.5.2 Recommendations

There are an estimated 600 Geography teachers and 756 Biology teachers in the service of the T.E.D. This gives a total of over 1 300 teachers. Many of these teachers require guidance in various aspects of their teaching. As there are certain problems concerning holistic teaching and fieldwork during their pre-service training there is an even greater need for in-service facilities in connection with environmental subjects.

It is recommended that the Transvaal Education Department considers establishing at least one permanent in-service training centre in a central situation (for example in Johannesburg). This centre could meet the day to day needs of teachers, organise in-service courses on a regular basis and, from the point of view of this study, ensure regular courses on Environmental Education. The centre would be invaluable in assisting teachers with fieldwork (both from the point of view of venues), and could also assist in the dissemination of resource materials (either originating from the centre or from teachers in the field). The Cape Department of Education has such a centre (in Mowbray) which provides the kinds of services suggested above. This centre has proved invaluable in the Cape (particularly with regard to environmental subjects) and it could serve as a model for a similar centre in the Transvaal.

6.6 RESOURCE MATERIALS

6.6.1 Conclusions

The latter part of Chapter Four deals with the availability of resource materials which are suitable for Environmental Education. The study found that, although there are a number of good 16 mm films available through the Audio-visual section of the Department of National Education there is a shortage of suitable charts and written materials. In addition, the 16 mm material just mentioned is mainly of overseas examples.

The T.E.D. has an audio-visual service which provides 35 mm slides and other aids on loan. There are a number of valuable sets of slides on aspects of Environmental Education, but at the moment stocks are limited, so that their use is limited. There is a

need to develop a wide range of slide materials, so that more teachers can make use of this facility.

Commercially produced material is available. There are some good sets of slides on the market, but they are mainly of overseas examples. Wall charts and similar material are also based on non-South African material. Much of the commercially available material may be bought by schools on allocation through the T.E.D.

The Wildlife Society of Southern Africa also produces resource materials for schools. The Society specialises in written materials related to Conservation Education. This is available at low cost to schools. At the moment the input of materials is small.

A final, yet most important point is that there appears to be a lack of co-ordination in the preparation and/or acquisition of resource materials. Despite the fact that the Audio-visual service of the T.E.D. acts, in part, as a "clearing house" for all audio-visual material there does not seem to be a co-ordinated programme.

6.6.2 Recommendations

Teachers are able to teach more effectively with good teaching aids. There is a need to improve resource materials generally for Environmental Education (and in particular for Conservation Education).

It is recommended that :

(i) more attention be given to the production of South African based materials of all kinds;

(ii) particular attention be paid to the production of wall charts and accompanying study guides. These are relatively cheap to produce, and they reach a wider audience as a result;

(iii) the T.E.D. continue to expand and develop its audio-visual aids section so that a greater number of teachers can use the facility;

(iv) every support be given to non-government organisations such as the Wildlife Society in the production of resource materials. They have the expertise and experience to be of invaluable service;

(v) the audio-visual service of the T.E.D. be more aggressive in developing a co-ordinated programme of resource material production or acquisition. In this regard the Service should not only concentrate on acquiring or producing materials but should act as a "go-between" between schools and other producers, so that the needs of schools can be met as quickly as possible. The teachers' centre (recommended in section 6.4.2) could assist by producing (or acquiring) study guides and other written material, and could liaise with the audio-visual service in this regard.

6.7 SYLLABUS AND SUBJECT COMMITTEES

6.7.1 Conclusions

The work of syllabus and subject committees in the area of the compilation of syllabuses and the support given to teaching programmes was discussed in Chapter 5.

The study found that national core syllabus committees for Geography and Biology do not confer on a common approach to environmental studies. There is also no communication on syllabuses being prepared. (New

core syllabuses for the country as a whole are prepared every few years.)

Once a core syllabus is prepared by a national core syllabus committee, it is given to the various education departments for adaptation by them. The study found that, in the case of the Transvaal Education Department, the Biology and Geography syllabus committees do not meet to discuss common ground topics or a common approach to environmental studies either . Thus an opportunity for holistic education is lost .

There are Study Committees for both Biology and Geography. These committees are comprised of inspectors of education, college lecturers and other qualified people. The Syllabus Committees are usually sub-committees of the Study Committee. The Study Committees are expected to meet from time to time to discuss problem areas in their subjects, to plan in-service courses, and to prepare written resource material for teachers. This study found that relatively few in-service courses have been organised in recent years (more courses were organised by the Biology Study Committee than by the Geography Study Committee) and that relatively litte material has originated from them.

6.7.2 Recommendations

The Syllabus Committees and the study committees are influential in the development and teaching of the various subjects. It is important that they do not only set a good example by their actions and activities, but that their various "in-puts" have value for Environmental Education. With this in mind the following are recommended :

(i) Syllabus committees for Biology and Geography at both national core level and at provisional level should confer on common ground topics and a common approach to Environmental Education;

(ii) the Study committees of the T.E.D. should liaise with each other in connection with the preparation of material suitable for Environmental Education. If the teachers' centre (suggested in section 6.5.2) is in operation it is recommended that the study committee have close liaison with this centre, and should have as a member of the study committee a member of staff from the centre.

(iii) It is not the task of the Study Committee to arrange and organise in-service courses. These should be handled by the in-service centre in liaison with the Study Committee.

6.8 GOVERNMENTAL AUXILIARY SERVICES AND ORGANISATIONS

6.8.1 Conclusions

Chapter 5 contains discussion on the contributions made by a number of governmental (i.e. national or provincial) services and organisations to Environmental Education.

The study shows that there is a potentially good framework for assistance to teachers in this field. The Educational Guidance section has the potential to assist, via its Youth Preparedness programme and its assistance to schools, extra-mural clubs and other activities through the Head of Department - Educational Guidance.

At this stage it would appear that Environmental Education is not receiving any emphasis (if fact it is almost lacking from Guidance syllabuses) and there is also a lack of support for school clubs from the Heads of Departments of Vocational Guidance.

The Veld School Movement also has the potential for assistance with Environmental Education since many thousands of children attend Veld School each year (in fact most of the Standard 5 and 8 pupils attend a School). However it would appear, from the aims and objectives of the Movement, that Environmental Education is not seen as being of fundamental importance. Despite the lack of aims and objectives linked to Environmental Education many of the activities are orientated towards it, and most Veld Schools are contributing to Environmental Education.

There are other problems concerning the work done at the Veld Schools. For one thing they are a "once-off" experience the long term benefit of which is doubtful, and for another there is little, if any, preparation before, or follow-up after the event. Such work is vital to the success of the Veld School, and particularly to Environmental Education.

The Transvaal Education Department has the unique service of the Schools' Journeys Service which is of great assistance in transporting children to fieldwork sites and in arranging food and accommodation. A problem hampering fieldwork activities in which children are transported by the Schools Journeys Service is that frequently the work is unco-ordinated. This is largely due to the lack of experience of teachers accompanying the pupils.

The Land Service Movement has the potential to make a substantial contribution to Environmental Education.

Both its aims and its activities are closely linked to Envinromental Education. At the moment relatively few children from Transvaal Secondary schools go on Land Service camps annually.

6.8.2 Recommendations

The potential support for teachers from outside agencies is invaluable in the case of Environmental Education. Not only may these agencies offer venues for outdoor activities, they may also offer expertise in specialised fields such as botany, zoology and agriculture. For this reason the assistance of outside agencies is invaluable. At the same time it would be unreasonable to expect outside agencies to reach all the pupils of all the secondary schools in the Transvaal. With this in mind it is recommended that :

(i) the activities of the Veld School be continued, but with greater emphasis on teacher training, both at pre-service as well as in-service level;

(ii) the Veld Schools pay more attention to Environmental Education, especially in their aims and objectives;

(iii) greater use be made of the Guidance programme at schools for Environmental Education. In addition to improvements to the Guidance syllabuses, there should be greater emphasis on the role of the head of Department of Guidance in assisting with the formation of environmentally orientated school clubs such as the Wildlife Clubs or the Biology Society;

(iv) the Transvaal Education department should provide the Schools' Journeys Service with suitable study guides. These would be given

to teachers accompanying school groups. Not only would they serve their purpose for the trip, but would also provide examples of work that could be done.

6.9 THE ROLE OF NON-GOVERNMENTAL ORGANISATIONS (NGO'S)

6.9.1 Conclusions

The Wildlife Society of Southern Africa is the only NGO which actively assists schools in the T.E.D. with extra-mural activities (Environmental Education courses, filmshows, and other similar activities) as well as with resource materials for both teacher and pupil.

The Society is dedicated to improving Conservation Education in schools and has a well qualified staff to meet the challenge. However a lack of finance hampers them in their task and at the moment their contribution is small.

6.9.2 Recommendations

Non-governmental organisations in the field of environmental conservation frequently have a dedicated staff with interest and enthusiasm. When this interest and enthusiasm is accompanied by expertise then the NGO is capable of producing materials of a high standard. For this reason it is recommended that the Transvaal Education Department give its support (moral support if not financial support) to accredited NGO's with regard to fieldwork activities or the production of resource materials. It is further recommended that the Transvaal Education Department liaise more closely with accredited NGO's in these two spheres of activity

6.10 Final conclusions

If one were to ask the question "Does the Transvaal Education Department consider Environmental Education as such, important in secondary schools?"the answer would have to be a qualified "no". The answer would be "no" because there is apparently no statement by the T.E.D. on Environmental Education and because of the problems relating to school syllabuses, teacher training, the provision of suitable resource material, the lack of fieldwork facilities and other problems discussed in the study and also in this section. The answer would be qualified however since there exists in the T.E.D. system much that can contribute to Environmental Education in Transvaal Secondary schools. Some of the aims and objectives of Biology and Geography are orientated to Environmental Education. Sections of the content also make their contribution. Organisations such as the Veld Schools and the Land Service also help develop Environmental Education. If the problems of the Transvaal Education Department in connection with Environmental Education could be solved (and they could be with little extra expense and effort) then the Department could become a powerful force in developing Environmental Education in high schools under their control.

The government White Paper on a "National Policy regarding environmental conservation" (Department of Water Affairs, 1980:6) calls for meaningful co-ordination of governemnt and private sector, and all "available machinery" to be used effectively in respect of Environmental Education in "all phases of education". This is an attitude which reflects the Government's determination to develop the correct attitude to the environment in all the people of South Africa. It is an attitude which requires the full support of all the education departments, Transvaal Education Department included, if it is to have positive results.

BIBLIOGRAPHY

1. ALDRICH, J.L.
"Education at the interface - the Chautauga meeting."
In : Aldrich, J.L.,Blackburn, A.M. and Abel, C.A. (eds.)
The report of the North American region seminar on Environmental Education.
Columbus : SMEAC Information Reference Centre, 1977.

2. BECKEDAHL, H.,DE VILLIERS, C. and EARLE,J.
Geography field studies for Transvaal high schools.
Geography Department, University of the Witwatersrand, 1979.

3. BERRY, M.F.
"The pressing need for Environmental Education."
USA today. May 1979, pp. 50-52.

4. BLOOM, B.S. (ed.)
Taxonomy of educational objectives : Handbook I : Cognitive domain.
London : Longman, 1972.

5. BONE, T.
"What is good teaching?" In : White, D. (ed.)
The practice of teaching.
Rhodesia : Longman , 1978.

6. BROWN, N.J.
"The challenge of our future." In : Aldrich, J.L., Blackburn, A.M. and Abel, C.A. (eds.)
The report of the North American region seminar on Environmental Education.
Columbus : SMEAC Information Reference Centre, 1977.

7. BUCHANAN , R.O. (ed.)
An illustrated dictionary of Geography.
London : Heinemann Educational Books, 1974.

8. BUWALDA, R.
Veld School Report.
Cyclostyled report on the activities of the Veld Schools.
Johannesburg : Johannesburg College of Education, 1979.

9. CEROVSKY, J.
"Comprehensive programmes of Environmental Education."
In : Conference document 33-6/KP/2, European working conference on Environmental Conservation Education.
Morges : IUCN, November 1971.

10. COMBES, J.J.
"Some views about limits." In : Aldrich, J.L., Blackburn, A.M. & Abel, C.A. (eds.) The report of the North American region seminar on Environmental Education.
Columbus : SMEAC Information Reference Centre, 1977.

11. CLAYTON, J.F.
Outdoor education in the United States of America Canada and Britain.
M.Ed. Thesis.University of South Africa, 1979.

12. CRATTY, B.J.
Human behaviour. Exploring educational processes.
Los Angeles : The University Press, 1971.

13. DALE, E.
Building a learning environment. Bloomington, Indiana : Phi Deltan Kappa Enc, 1972.

14. DAVIES, D. (ed.)
A dictionary of anthropology.
Essex : The Anchor Press, 1972.

15. DOLSON, J.
"Environmentally educated". Science and children, May 1979, pp. 21-24.

16. DOWNING, H.
More detailed comparison of environmental studies and conservation education. Unpublished notes, 1977.

17. DUMINY, P.A. and SÖHNGE, W.F.
Didactics : Theory and practice. Cape Town : Longman, 1980

18. DUSHKIN publishing group.
Encyclopaedia of Psychology. Connecticut: 1973.

19. EALES, W.C.
"Jan Smuts : Die filosoof." In : Van boereseun tot die statebond se voornaanste staatsman.
Supplement to Die Volkstem. 2 May 1940, p.31.

20. EDUCATION AND CULTURE (Department of)
Our population predicament. A new look.
Salisbury : December 1979.

21. EDUCATION AND TRAINING (Department of)
Syllabus for the lower primary school. Pretoria: 1967.

22. ENGELBRECHT, S.W.B. and LUBBE, A.N.P.
General method and school organisation.
Parow : Via Afrika, 1978.

23. FARRANT, J.S.
Principles and practice of education.
London : Longmans, 1964.

24. FENSHAM, P.J. and MAY, J.B.
"Servant not Master - A new role for science in a core of Environmental Education". The Australian science teachers journal. Vol 25(2), 1979, pp. 15-24.

25. GLASSER, R.
"An alternative school approach to Environmental Education". In: Swan, J.A. and Stapp, W.B. (eds.)
Environmental Education.
New York : John Wiley, 1974.

26. GOOD, C.V.
Dictionary of education.
New York : McGraw Hill, 3rd edition. 1973.

27. GREENALL, A.
"Innovations in science education - CDC's Environmental Education project." The Australian science teachers journal. Vol. 25 (1), 1977, pp. 31-46.

28. GUTEK, G.L.
Philosophical alternatives in education.
Columbus, Ohio : Charles Merrill, 1974.

29. HALDANE, J.S.
"Life and mechanism." Mind. Vol. IX, 1884 pp. 27-47.

30. HARRIS, A.
"Autonomy." In : Unit 8 : Curriculum philosophy and design.
Beetchley, Buckinghamshire : Open University Press, 1972.

31. HARVEY, G.D.
"A conceptualization of Environmental Education." In : Aldrich, J.L., Blackburn, A.M. and Abel, C.A. (eds.) 1976 : The report of the North American region seminar on Environmental Education.
Ohio : SMEAC Information Reference Centre, 1976.

32. HENDRICK, J.
Total learning for the whole child. Holistic curriculum for children ages 2 to 5.
St. Louis : C.V. Mosby Company, 1980.

33. HENNING, J.
"Environmental Education with particular reference to the approach of the Transvaal Education Department."
Education Bulletin. Vol. XXIII, No. 3, Transvaal Education Department, Pretoria, 1979, pp. 53-67.

34. HOEBEL, E.A.
Man in the primitive world.
New York : McGraw-Hill, 1958.

35. HOPKINS, C.A.
"Environmental Education in the school system."
In : Aldrich,J.L., J.L. Blackburn, A.M. and Abel,C.A. (eds.) The report of the North American regional seminar on Environmental Education.
Ohio : SMEAC Information Reference Centre, 1976.

36. HUGHES- EVANS, D. (ed.)
Environmental Education : Key issues of the future.
Oxford : Pergamon Press, 1977.

37. HUNTER, D.E. and WHITTEN, P. (eds.)
Encyclopaedia of Anthropology.
New York : Harper and Row, 1976.

38. HURRY, L.B.
Is conservation awareness one of the aims of formal education in South Africa ? An assessment with special regard to Geography and Biology teaching.
Johannesburg : Wildlife Society of Southern Africa, 1978 (a).

39. HURRY, L.B.
Memorandum on Veld Schools - Objectives and modus operandi.
Johannesburg : Johannesburg College of Education, 1978 (b).

40. HURRY, L.B.
"Conservation awareness and Geography teaching in South Africa." The South African Geographer, Vol. 7, No. 1, April 1979, p.80.

41. HURRY, L.B.
Teaching strategies with regard to outdoor education.
Unpublished paper read at workshop on outdoor education.
Pretoria : Unisa, 1980.

42. IUCN.
Final report on international working meeting on Environmental Conservation Education in the school curriculum.
Morges : IUCN Publications, 1970.

43. JERNIGAN, H.D. and WIERSCH, L.
"Developing positive student attitudes towards the environment." The American Biology Teacher.
January, 1978, pp. 30 - 35.

44. JOHANNESBURG COLLEGE OF EDUCATION.
Curriculum for higher diploma in education and diploma in education.
Johannesburg : Internal publication of the Johannesburg College of Education, 1978.

45. JOHNSTON, J.A.
Six questions. Controversy and conflict in education.
Sydney : John Wiley, 1975.

46. KARLIN, J.
Man's behaviour. An introduction to social science.
New York : MacMillan, 1967.

47. KAZIMIAS, A.M.
"Education in international perspective: Focus on change and modernisation." In: Keller, G.F. (ed.) Foundations of education.

48. KNELLER, G.F.
Educational anthropology : An introduction.
New York : Krieger Publishing Company, 1978.

49. KOFFKA, K.
Principles of gestalt psychology.
London : Routledge & Keegan Paul, 1962.

50. KOHLER, W.
The task of gestalt psychology.
New Jersey : Princeton University Press, 1969.

51. KRATWOHL, D.R. and BLOOM, B.S.
Taxonomy of educational objectives : Handbook II : Affective domain.
London : Longman, 1964.

52. LANDMAN, W.A.
Inleiding tot die fundamentele pedagogiek.
Johannesburg : Afrikaanse Pers, 1969.

53. LAPEDES, D.N.(ed.)
Encyclopaedia of environmental science.
New York : McGraw Hill, 1974.

54. LASKA, J.A. and GOLDSTEIN, S.L.
Foundations of teaching method.
Dubuque, Texas : Brown, W.M.C., 1973.

55. LAWTON, D.
"Maintaining a supportive physical environment for man : How the schools may help." In : Miel, A. and Berman L.(eds.)
Educating the young people of the world.
Washington : Association for supervision and curriculum development, 1970.

56. LAWTON, D.
Social change, educational theory and curriculum planning.
London : University of London press, 1973.

57. LEONARD, J.M.,FALLON, J.F. and VON ARX, H.
General methods of effective teaching. A practical approach.
New York : Thomas Y. Crowell, 1972.

58. LEOPOLD, A.
A sand county almanac.
New York : Oxford University Press, 1966.

59. LINK, R.D.
Environmental Education in Australia, Part I. Final report on a national survey of Environmental Education in Australia, 1973/74, cyclostyled.
Monash : Faculty of Education. Monash University, 1976.

60. MCINNES, N. and ALBRECHT, D. (eds.)
What makes education environmental?
Kentucky : Data Courier and Environmental Educators, 1975

61. MADDEN, E.H.
Philosphic problems of psychology.
New York : John Wiley & Sons, 1962.

62. MARKER, M.E.
Geography and the affective domain. An ethic for an environmental science.
Fort Hare : Fort Hare University Press, 1978.

63. MARSDEN, W.E.
Evaluating the geography curriculum.
Edinburgh : Oliver and Boyd, 1976.

64. MILLAR, J.C.J.
The objectives of outdoor education. Unpublished paper read at a conference on oudoor education.
Pretoria : Unisa, 1980.

65. MONTGOMERY, E.
"The unity of the organic individual."
Mind.
Vol. V. 1880, pp. 318-336.

66. MAYO, F.J.
Crucial agreements and differences among leading thinkers in contemporary education.
Unpublished thesis.
Pretoria : Unisa, 1977.

67. NAGEL, E.
"Mechanistic explanation and organismic biology."
In : Madden, E.H. (ed.) The structure of scientific thought.
Boston, 1960.

68. NATIONAL EDUCATION (Department of)
35 mm filmstrips of the division of audio-visual education, 1976.
16 mm films of the division of audio-visual education (1981-1985).

69. NATIONAL EDUCATION(Department of)
The landservice movement of the Department of National Education.
Pretoria, Undated.

70. NIGHTINGALE, C.S.
An analysis of the education potential of sites in the Cape Peninsular for secondary school field-work in environmental studies.
M.A. thesis, University of Cape Town. 1977.

71. OBERHOLZER, C.K.
Inleiding in die prinsipiele opvoedkunde.
Pretoria : Moreau and Company, 1954.

72. OBERHOLZER, C.K.
Prolegomena van 'n prinsipiële pedogogiek.
Cape Town : Haum, 1968.

73. PAGE, G. Terry and Thomas, J.B. (eds.)
International dictionary of education.
London : Kegan Page, 1977.

74. PASQUES, L.
Buitelugopvoeding. Voorsiening en opleiding van personeel.
Unpublished paper read at conference on outdoor education.
Pretoria : University of South Africa, May 1980.

75. PETERS, R.S.
Education and the education of teachers.
London : Routledge and Keegan Paul, 1977.

76. PHILLIPS, D.
Holistic thought in social science.
London : Macmillan, 1977.

77. PITTENGER, O.E., and GOODING, C.T.
Learning theories in educational practice : An integration of psychological theory and educational philosophy.
New York : John Wiley and Sons, 1971.

78. RIMER, T.
"An integrated approach to Environmental Education."
Educational Journal.
April 1980, pp. 17-30.

79. RIPLEY, S.D. and BUECHNER, H.K.
"Ecosystem science as a point of synthesis."
In: Day, J.A., Frost, F.F., Rose, P.R., (eds.)
Dimensions of the environmental crisis.
New York : John Wiley and Sons, 1971.

80. ROSENBLATT, D.
Die opvoedkundige taak van die Nasionale Parke van Suid Afrika.
M. Ed. thesis. University of South Africa, 1974.

81. ROSKIN, R.
Learning by experience. Theory and practice.
Bradford, England : MCB Monograph, 1976.

82. SAVELAND, R.N. (ed.)
Handbook of Environmental Education.
London : John Wiley and Sons, 1976.

83. SCHOFIELD, H.
The philosophy of education : An Introduction.
London : George Allen and Unwin, 1972.

84. SCOTTISH EDUCATION DEPARTMENT.
Environmental Education.
HMSO, Edinburgh, 1974.

85. SEYMOUR, T.
"What is good teaching in the primary school?"
In: White, D. (ed.)
The practice of teaching.
Rhodesia : Longman , 1978.

86. SMUTS, J.C.
Holism and evolution.
2nd edition. London : MacMillan, 1926.

87. SMYTH, J.C.
"The biological framework of Environmental Education."
Journal of biological education.
Vol. 11 (2), 1977, pp. 103-108.

88. STANDER, E.H.H.
Die ekologiese krisis en die opvoedkundige implikasies daarvan, 'n Empiriese studie.
M. Ed Thesis. University of South Africa, 1976.

89. STAPP, W.B.
"Environmental Education : A major advance".
In: Aldrich, J.L., Blackburn, A.M. and Abel, G.A. (eds.)
The report of the North American regional seminar on Environmental Education.
Columbus : SMEAC Information Reference Centre, 1977.

90. STAPP, W.B.
What is Environmental Education?
Cyclostyled information brochure on the work of the School of Natural resources.
Ann Arbor : University of Michigan, 1978 (a).

91. STAPP, W.B.
An instructional program approach to Environmental Education (K-12) - based on an action model.
Cyclostyled paper. School of Natural resources.
Ann Arbor : University of Michigan, 1978 (b).

92. SWAN, M.
"Forerunners of Environmental Education." In: McInnes, N and Albrecht, D. (eds.) What makes education environmental ?
Washington, D.C. : Data Courier and Environmental Educators, 1975.

93. SWAN, J.A. and STAPP, W.B.
Environmental Education, strategies towards a more livable future.
New York : John Wiley and Sons, 1976.

94. THEODORSON, C.A. and THEODORSON, A.G. (eds.)
A modern dictionary of sociology.
London : Methuen, 1967.

95. TINLEY, K.L.
(Ecology) The study of the "incomprehensible" by the "incompetent".
Mimeograph of the proceedings of a symposium of SARCCUS.
Pretoria : 1974.

96. TINLEY, K.L.
Framework of the Gorongosa ecosystem. Mocambique.
Doctoral thesis. University of Pretoria, 1977.

97. TRANSVAAL EDUCATION DEPARTMENT. STUDY COMMITTEE FOR BIOLOGY.
Various guides for Biology. 1969.

98. TRANSVAAL EDUCATION DEPARTMENT.
Syllabus for Geography (Higher and Standard Grade). Standards 8, 9, 10. 1972.
Syllabus for Geography. Standards 5, 6, 7. 1972.
Syllabus for General Science (Biology section), Standards 5, 6, 7. 1972.

99. TRANSVAAL EDUCATION DEPARTMENT.
Die kurrikulum van die Primêre Skool. March, 1973.

100. TRANSVAAL EDUCATION DEPARTMENT. STUDY COMMITTEE FOR GEOGRAPHY.
Various guides for Geography. 1973.

101. TRANSVAAL EDUCATION DEPARTMENT.
Syllabus for Biology (Higher Grade). Standards 8, 9, 10. 1977.

102. TRANSVAAL EDUCATION DEPARTMENT.
"Veld Schools for the Transvaal."
Educational News Flashes. Number 56, December, 1979(a).

103. TRANSVAAL EDUCATION DEPARTMENT.
Media guide. December, 1979. 1979 (b).

104. TURNEY-HIGH, H.H.
Man and system : Foundations for the study of human relations.
New York : Appleton-Century-Crofts, 1968.

105. UNESCO - UNEP
"Environmental Education newsletter."
Connect.
Vol. No. 1, 1976, pp. 1-2.

106. UVAROV, E.B., CHAPMAN, D.R. and ISAACS, A.
"A dictionary of science".
Harmondsworth : Penguin Books, 1977.

107. VAN DEN BERG, D.
Being and education. An essay in existential phenomenology.
New Jersey : Prentice Hall, 1971.

108. VAN DER STOEP, F. and VAN DER STOEP, O.A.
Didactic orientation.
Toronto : McGraw-Hill, 1973.

109. VAN RENSBURG, C.J.J., KILIAN, C.J.G. and LANDMAN, W.A.
Notes on fundamental pedagogic concepts. An introductory orientation.
Pretoria : N.G. Kerk Boekhandel, 1979.

110. VILJOEN, T.A. and PIENAAR, J.J.
Fundamental pedagogics.
Durban : Butterworths, 1971.

111. WARD, C. and FYSON, A.
Streetwork. The exploding school.
London : Routledge and Keegan Paul, 1973.

112. WATER AFFAIRS, FORESTRY AND ENVIRONMENTAL CONSERVATION.
White paper on a National policy regarding environmental conservation.
Pretoria, 1980.

113. WEBSTERS THIRD NEW INTERNATIONAL DICTIONARY OF THE ENGLISH LANGUAGE.
Springfield, Massachusetts, 1966.

114. WEINBERG, C.
"Social change." In : Keller, G.F. (ed.)
Foundations of education.
New York : John Wiley and Sons, 1971.

115. WHITEHEAD, A. N.
Process and reality. An essay in cosmology.
Cambridge : Cambridge University Press, 1929.

116. WHITEHEAD, A.N.
"The aims of education." In : Johnson, B. (ed.)
Issues in education. An anthology of controversy.
Boston : Houghton Mifflin, 1978.

117. WIGSTON, D.L.
"Problems of subject integration in environmental science." In : Hughes-Evens, D. (ed.)
Environmental Education key issues of the future.
Oxford : Pergammon Press: 1977.

118. WINICK, C. (ed.)
Dictionary of Anthropology.
Connecticut : Greenwood Press, 1956.

119. WOLMAN, B. (ed.)
Dictionary of behavioural science.
New York : Van Nostrand Rheinhold, 1973.

120. YULE, R.M.
A comparative study of the nodal position of the state secondary school principal in relation to certain societal structures with special reference to England, Scotland, West Germany and the Transvaal.
Unpublished D. Ed. thesis, UNISA, 1978.

121. YULE, R.M.
Didactics in comparative education. H.E.D. Guide 1.
Pretoria : UNISA, 1979.

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APPENDIX A : AIMS AND OBJECTIVES OF THE BIOLOGY AND GEOGRAPHY SYLLABUSES OF THE TRANSVAAL EDUCATION DEPARTMENT AND AN ASSESSMENT OF THEIR RELEVANCE TO ENVIRONMENTAL EDUCATION.

NOTE : The aims and objectives in this appendix have been assessed in terms of their relevance to Environmental Education. The symbols used in the assessment are A, K, B, N and E.

(A) is an aim linked to Attitudes,
(K) an aim linked to Knowledge (including skills and techniques),
(B) is related to Behaviour,
(N) refers to an aim that does not fall into any of these categories, and
(E) signifies that the aim has direct relevance for Environmental Education.

I. The aims of General Science (Junior Secondary Phase)

II. The aims of Biology (Senior Secondary Phase)

III. The aims of Geography (Junior Secondary Phase)

IV. The aims of Geography (Senior Secondary Phase)

THE AIMS OF GEOGRAPHY (JUNIOR SECONDARY PHASE)

INTRODUCTION

Geographical knowledge is essential for the person who wishes to have an intelligent understanding of newspapers, radio broadcasts and what happens daily. Hence the emphasis in the syllabus on newspaper and radio news geography throughout the three standards and on as much contact with reality as possible. Geography must keep pace with newspaper headlines, political developments, international trade, the population explosion and other problems. With this approach constant reference to atlases and maps, whenever necessary, cannot be over emphasized.

1. GENERAL AIMS

1.1 To develop an awareness of the world's place-to place variety.(K) (E)

1.2 To develop intellectual aptitudes and awaken "geographical curiosity". (K) (A)

1.3 To lead pupils to a realisation of the grandeur and wonder of Creation. (A)

1.4 To help pupils develop a sense of reality in all their geographical work. (K) (A)

1.5 To develop tolerance of attitudes by assisting pupils to recognise and understand the problems of their own and other countries, and how local circumstances influence man's ways of life. (A)

2. SPECIFIC AIMS

2.1 To help pupils develop a sense of discovery in the acquisition of geographical knowledge. (K)

2.2 To develop competence in the use of maps and to explain, simply, the concept of map projections (K)

2.3 To give pupils a basic geographical vocabulary which will assist them to think and write clearly and concisely. (K)

2.4 To teach pupils the basic elements of geographical observation (K) (A)

THE AIMS OF GENERAL SCIENCE (JUNIOR SECONDARY PHASE)

INTRODUCTION

1. GENERAL AIMS

1.1 To develop , through contact with the subject matter, a reverence for the Creator and an esteem for the wonders of the created universe. (A) (E)

1.2 To develop an inquiring mind, an interest in, and a desire for personal investigation of natural phenomena. (K) (E)

1.3 To develop a contemporary outlook on and view of the natural sciences. (A)

1.4 To acquire the correct laboratory techniques in the handling of apparatus. (K)

1.5 To enable the pupil to acquire the ability to perform experimental work correctly, both individually and in groups by :

(a) recognising and formulating problems ;
(b) assembling the relevant data in connection with a problem;
(c) carefully planning the investigation in advance;
(d) making careful observations;
(e) making accurate reports of such observations;
(f) assembling adequate and relevant data in respect of the experiment;
(g) critically evaluating the data before making deductions. (K)

1.6 To indicate that science is not omnipotent and infallible. (A)

1.7 To afford pupils the opportunity for planning and carrying out independent investigations either individually or in groups, and to discuss their findings. (K)

1.8 To bring pupils into contact with different branches of science so that they may discover possible interests and aptitudes which will enable them to make an intelligent choice of subject for further study or for a vocation. (N)

1.9 To lay a foundation for further studies of the sciences. (K)

2. SPECIFIC AIMS

2.1 To develop a respect for, and a sense of, responsibility towards nature and the utilisation of natural resources. (A) (E)

2.2 To cultivate the habit of handling organisms with discretion. (B) (E)

2.3 To provide opportunities to investigate and to study plants and animals in their natural environment. (K) (E)

2.4 To introduce pupils to the vast variety of organisms in nature. (K)

2.5 To familiarise pupils with the inter-relationship that exists between man, other living organisms and the environment. (K) (E)

2.6 To make pupils aware of man's role in the environment. (A) (E)

2.7 To develop the incentive to read about scientific topics. (A)

2.8 To guide pupils' interests in a scientific direction and so provide a choice of leisure-time activities. (A) (B)

2.9 To develop a concept of the structure of matter. (K)

2.10 To discover some of the changes which may take place in matter. (K)

2.11 To make pupils aware to some extent of the relationship between energy and changes in matter. (K)

THE AIMS OF BIOLOGY (SENIOR SECONDARY PHASE)

1. INTRODUCTION

1.1 GENERAL OBJECTIVES

1.1.1 The development of an understanding of the meaning of the basic unifying themes of biology by learning relevant facts, concepts and generalizations. (K)

1.1.2 The development of patterns of behaviour associated with inquiry skills, which lead to effective scientific methods of solving problems.

These include the

1.1.2.1 recognition and formation of the problem; (K)

1.1.2.2 consideration of the possible solution(s) to the problem and careful planning of the investigation (K)

1.1.2.3 compilation of data relating to the problem through accurate observation and/or experimentation. This should include such cognitive skills as measuring, classifying, inferring, organising, sampling, using controls and preparing tables and graphs; (K)

1.1.2.4 preparation of a thorough and accurate report of the results; (K)

1.1.2.5 selection of relevant data; (K)

1.1.2.6 critical evaluation of the data before giving any interpretation of the results. (K)

1.1.3 The acquiring of positive values and attitudes which underlie the biological sciences. (A) (E)

These include

1.1.3.1 a desire to know more about natural phenomena; (A) (E)

1.1.3.2 an appreciation of the value of accurate observation; (A)

1.1.3.3 a desire to make one's own observations and to make independent investigations; (A) (B) (E)

1.1.3.4 an appreciation and understanding of the contributions which scientists have made to the subject; (A)

1.1.3.5 an understanding of the value of verification of interpretations which involves criticism, testing and experimentation; (A)

1.1.3.6 a belief in critical open mindedness and an appreciation that knowledge is incomplete, tentative and will change; (A)

1.1.3.7 a feeling of responsibility for nature and the preservation of natural resources (A) (B) (E

1.1.3.8 a respect for logic and the need for bringing order to any collection of facts or knowledge; (A)

1.1.3.9 the desire to use ideas, to provide originality and the use of imaginative thinking; (A)

1.1.3.10 an appreciation of the need for developing the ability to communicat accurately and clearly. (A)

1.1.4 The cultivation of an awareness and respect for the creation and an appreciation of our natural heritage of South African flora and fauna. (A) (B) (E)

1.2 SPECIFIC OBJECTIVES

1.2.1 To make pupils aware of the great diversity of organisms as well as of their unity of pattern. (K)

1.2.2 To show the interdependence between the organisms and between organisms and their environment. (K) (E)

1.2.3 To show the complementarity of structure and function. (K)

1.2.4 To show the genetic continuity and maintenance of life. (K)

1.2.5 To show that changes in structure and function maintain the organization of a living organism in the face of the changing environment. (K)

THE AIMS OF GEOGRAPHY (SENIOR SECONDARY PHASE)

INTRODUCTION

..... "the aim of education should be to develop to the full the potentialities of every child at school, in accord always with the general good of the community of which he is a member."

(H.S.T. 1942 p.12)

1. GENERAL AIMS

1.1 To develop an understanding of the interplay of phenomena which give distinctive character to places (K) (E)

1.2 To develop an awareness of the world's place-to-place variety. (K)

1.3 To draw attention to unity and diversity in the world, and the resultant interdependence of regions and nations. (K)

1.4 To develop intellectual aptitudes and awaken "geographical curiosity". (A)

1.5 To stress the unity of knowledge through the links Geography has with other subjects. (A) (E)

1.6 To develop a sense of reality in the minds of pupils in all their geographical work. (A)

1.7 To develop tolerance of attitudes by assisting pupils to recognise and understand the problems of their own and other countries, and how local circumstances can influence man's ways of life. (A) (E)

1.8 To draw attention to the often crucial problems which mankind must face to provide for increasing population numbers and higher living standards. (K) (E)

1.9 To lead pupils to an appreciation of the vastness and wonder of Creation. (A) (E)

2. SPECIFIC AIMS

2.1 To develop a sense of discovery in the acquisition of geographical knowledge. (A)

2.2 To awaken pupils to the possibility of applying geographical knowledge to projects designed to secure better use of earth's resources. (K) (E)

2.3 "To teach geography as an applied science". (K) (E)

(Unesco; 1965)

2.4 To acquire a basic geographical vocabulary which will assist pupils to write explanations clearly, correctly and precisely. (K)

2.5 to help pupils to understand the more important geographical concepts and to supply them with an adequate body of ordered facts. (K)

2.6 To develop competency and skill in the use and interpretation of maps, aerial photographs and other basic "tools". (K)

2.7 To train pupils in the simpler techniques of geographical fieldwork and reporting. (K)

2.8 To equip pupils for self-inquiry and further study. (K)

2.9 To train pupils :

2.9.1 "to interpret the facts of distribution

2.9.2 to correlate the life of man with his physical environment

2.9.3 to explain the interaction of human and natural agencies." (K)

(Debenham, 1950)

2.10 "To teach pupils to observe and think geographically". (K)

(Unesco, 1965)

Appendix B

342 Main Street
Waterkloof
0181

1980–07–10

COPY OF LETTER SENT TO ALL RELEVANT LECTURERS AT THE VARIOUS TEACHER TRAINING INSTITUTIONS.
(A similar letter was sent in respect of Geography.)

Dear Sir/Madam,

I am conducting research into Environmental Education in Transvaal Secondary schools with special reference to the teaching of Biology and Geography.

Aspects of the research relate to teacher training (both at the in-training as well as at the in-service level) and to the provision of certain resource materials. In order to make the research as comprehensive as possible it would be appreciated if you could supply information with regard to the activities of your department by answering the following questions:

1. Do the students taking Biology as a teaching subject receive training in the planning and management of outdoor practical work or fieldwork? Please give details (where applicable) for:

   1.1 Lower Primary level (as part of Environmental Studies)
   1.2 Higher Primary level
   1.3 Junior Secondary level } As part of General Science
   1.4 Senior Secondary level

2. Do the lecturers involved with the training of Biology teachers have contact with the lecturers involved with the training of Geography teachers with regard to common-ground topics, fieldwork, etc.? If so, please give details briefly.

3. Is your department involved with, or has your department been involved with, in-service training programmes or courses? If so, please give brief details of programmes or courses over the past 3 years.

4. If your department is or has been involved with in-service training for teachers, to what extent are the activities of any programmes involved with outdoor practical work or fieldwork?

5. Has your department produced any resource material (notes, guides, slides, etc.) aimed at either improving knowledge or at improving teaching methods in Biology, for high school teachers over the past 3 years. If so please give details briefly. (In particular please stress resource material related to outdoor activities).

Your co-operation would be much appreciated,

Yours faithfully,

L.B. HURRY